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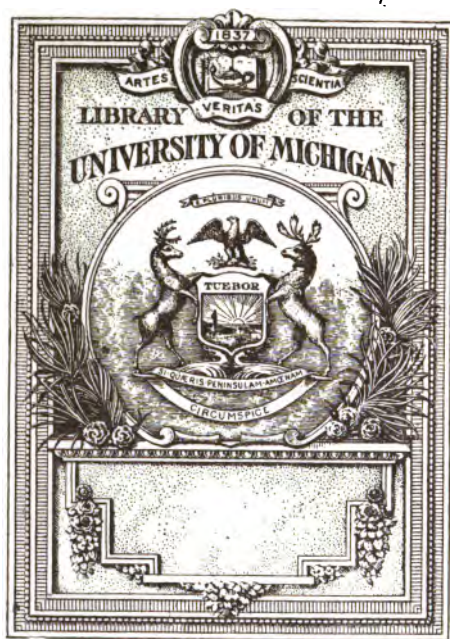
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G. Blanchon



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# **THE NEW WARFARE**



# THE NEW WARFARE

BY

G. BLANCHON

AUTHOR OF

'LE CUIRASSÉ ET SES ENNEMIS SOUS-MARINS'

'LES SOUS-MARINS ET LA GUERRE ACTUELLE'

TRANSLATED BY

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## PUBLISHERS' NOTE

**W**E are indebted to Messrs Armand Colin, Paris, for permission to publish a translation of Mr G. Blanchon's *La Guerre Nouvelle*. The author is an expert on naval warfare and on the development of the submarine; already in 1913 his work *Le Cuirassé et ses ennemis sous-marins* had attracted much attention, and had been awarded a prize by the Académie des Sciences Morales et Politiques.

Mr. Blanchon is at the same time an authority on every aspect of modern war, a cogent thinker with an extraordinary range of vision, and the attempt which he makes in this book, not only to expound the war that is, but also to forecast the warfare of the future, is a contribution to present-day knowledge and speculation which far exceeds in importance the visions of Jules Verne, whose name he so modestly invokes.



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# THE NEW WARFARE

## CHAPTER I

### WHEN WILL WAR CEASE ?

**T**HE war now drawing to its close is bringing a new world into being. There is one domain, however, which it affects above all others, that of military science. Both the conditions under which we can live at peace and the art of war itself are being transformed. It is, of course, too early for technicians to deduce the final lessons ; as yet it is only dreamers that hold the field. May one of these be allowed to evoke the shade of the illustrious Jules Verne and follow up, wherever they will take us, a few of the vistas that have suddenly opened to our gaze ? . . .

“ Why trouble about future wars ? ” we shall be asked. “ Will not this be the last ? Will not arbitration henceforth take the place of armed conflict ? If so many heads of families set out willingly for the battlefield it was because they were determined to put an end to this era of bloodshed and to spare their children and

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their children's children for all time the horrors which we have had to endure. Will it not be with nations as it was once with individuals? In the primitive state of society private quarrels were decided by combat ; afterward came tribunals. Already we have the Tribunal of Nations at The Hague. We shall no longer allow the injured themselves to redress their wrongs. The task of to-morrow will be the creation of the United States of Europe and the promulgation of one law for all mankind. . . ."

Many are those who thought thus in the early days of the war. Such generous ideas sustained and encouraged them. But they are probably less numerous to-day when we have probed too deeply human wickedness and depravity. If crime and violence still exist among individuals after millenniums lived under a legal *régime*, if duelling is still tolerated in France and honoured in ' virtuous ' Germany, how many centuries will yet elapse before a nation can live without girding on the sword and buckling on its armour ?

How many, if we consider that we are dealing no longer with individuals but with peoples, and that in any community the time required for its evolution increases in proportion with its numbers ? A century is but a day in the evolution of societies. But let us

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carry the comparison farther. Whence arose the reign of law amidst mankind ? Plainly, from large numbers. Can we believe that it could ever have become established in a small community of a few dozen individuals ?

The curb for human passions lies in the immensity of the body social. Ambition, hatred, cupidity will never be suppressed. Now, these powers of evil, by reason of their very intensity, sow violence broadcast ; human energy would seem inevitably to be on the side of injustice. It is a fatality incident to human nature that the many be harassed and troubled by the ambition of one ; to the vigour of the latter's thrust and the prestige of his environment, the former can only oppose lukewarm, faint, and wavering tendencies to virtue, and even these are hindered by outbreaks of their own vices. Weak longings for order will always be overborne by determined designs to bring about disorder ; to crush a single one of these requires the combined will of thousands.

How, then, does it generally come to pass that this condition, so difficult of realization, becomes the absolute law *de jure* and almost the invariable rule *de facto* ? Because justice is the one idea which unites those who have no axe to grind. Such, in legal contests, are innumerable, whereas every enterprise



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involving injustice appeals only to the small group of those who profit directly thereby.

The theory of permanent peace assumes that in every international conflict there shall be a sufficiency of different interests beyond the radius of disturbance to ensure a large majority of witnesses qualified to judge the question at issue. It presupposes the splitting up of humanity into numerous peoples sufficiently free to express an opinion, sufficiently powerful to support it, and sufficiently united to take combined action. We need only enumerate the Great Powers capable of effective intervention on a given issue to realize how far we are from such an ideal.

All the same, we are drawing nearer to it ; we may reasonably hope for a future when all the conditions of legal peace shall be realized. And this will happen all the more easily from the fact that the new instruments of warfare facilitate the collaboration, on the same field of action, of the Powers the most remote. Take the most recent of all fighting weapons, the aeroplane : it is also the most mobile of military forces. Before long it will be possible for a contingent of troops to fly in the space of a few days from the Antipodes to the aid of a threatened ally. No frontier will prove a barrier to it.

The navy possesses the advantage of being

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able to make use of the whole world almost to the same extent as the army in the air. Air and water form common meeting-places for all peoples: the forces of the entire inhabited world can there be concentrated. As the centuries roll on, the sea plays an ever-increasing part in international struggles. The more exchange of commodities increases and populations accumulate, the more does its *rôle* tend to predominate.

In barbarous ages all wealth and power proceeded from the land; no man, unless he took land, had any influence or power over another. Now, however, economic factors are acquiring such decisive importance in the life of a people, their life depends so largely on their economic and financial position, that they can be affected from without. They are vulnerable both in their commerce and in their credit. War is carried on with goods and money, things essentially mobile, which may be conveyed from the confines of the earth into the hands of a coalition of infinite complexity.

Even now we see the multiplication of small European States worthy to figure in the comity of nations. In the Balkans have just appeared the last-born of the European world; already their weight is making itself felt in the scales of justice. Political subdivisions are visibly encouraged by the progressive emancipation of

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colonies which are becoming independent moral entities. In this direction nothing is more significant than British federalism, the most recent manifestations of which are seen in the granting of autonomy to South Africa and of Home Rule to Ireland.<sup>1</sup>

The rapid peopling of the earth has a similar tendency ; it prepares for the splitting up of certain unwieldy States and gives weight and influence to nations that are new, such as the Argentine Republic, or rejuvenated, such as Japan. Lands but lately unpopulated as well as lands that have been slumbering for ages are gradually raising their voices and arming in defence of right. We are shortly to witness the renaissance of Poland, perhaps also the breaking up of the heterogeneous aggregations erected by the unjust might of the two Germanic empires. Peace will benefit, as well as liberty.

It is a step forward. Still, even though it should render possible in the immediate future international legislation which none could withstand, we are but little likely to see this result at once in the creation of a stable and permanent order of things. Through what convulsions must we pass before there can be established over the nations a law which shall

<sup>1</sup> The author has assumed that Home Rule is an accomplished fact.

## WHEN WILL WAR CEASE ?

be obeyed by strong and weak alike ! Truly we may expect to see ere then some formidable fissures in the Temple of Peace !

The greater the obstacles to armed conflicts, the more violent will they become : the forces of disorder will accumulate under constraint, like steam compressed within a closed vessel. We are now witnessing the spectacle of two huge camps, comprising nearly all the populations of Europe ;<sup>1</sup> but some day we shall see the world rent in twain : the entire earth will be aflame.

The advent of tribunals did not put an end to the reign of violence ; it only made arms a monopoly reserved to the police. Every one knows that the army has its part to play as a police ; consequently the legal use of force, the right to kill, may happen to fall to many of ourselves. If war were a thing of the past, there would remain not only policemen, but also soldiers and guns, were it only to maintain peace at home.

Similarly, legal sanctions and a 'public force' will be needed with nations. We shall have to put down the refractory or be prepared to do so. We must keep our hand armed with the forces of destruction and pursue the art of war in its latest improvements, that the administrators of the law may dominate the progress secretly made by malevolent nations.

<sup>1</sup> 1916.

## CHAPTER II

### AN INADEQUATE REMEDY

**T**HIS does not mean that we must not henceforth try to make wars less frequent. The only people to denounce arbitration as a failure will be those who expected it to perform miracles. We may be stubbornly determined to make it do everything it is capable of doing, without deluding ourselves as to the limits of its utility. It will provide a solution for conflicts which, so frequently in the past, have brought on war without deep reasons therefor : from excessive haste, or because the opportunity was a tempting one, from lack of political tact, or from over-sensitiveness. Nations suffer from 'nerves' as well as individuals ; they are timid and suspicious ; besides, they are less given to reflecting. By allowing time to work and by showing a certain amount of confidence, many a quarrel settles down, many a misunderstanding vanishes into thin air. Even those of evil intent sometimes hesitate before an act of premeditated violence if some

## AN INADEQUATE REMEDY

legal process, by depriving them of an excuse, should compel them too openly to expose their malevolent designs.

We may accept these palliatives if we take care not to be deceived by them. Another remedy, of a more chimerical nature, has been advocated: the suppression of war industries. Mr H. G. Wells gives the name of Kruppism to the system of manufacturing arms in private works, the most redoubtable instance of which is afforded by Krupp's. "Time after time," he says, "this huge business, with its bought newspapers, its paid spies, its agents, its shareholders, its insane sympathizers, its vast ramifications of open and concealed associates, has defeated attempts at pacification, has piled the heap of explosive material higher and higher. . . . This folly must end. There must be no more buying and selling of guns and warships and war machines. There must be no more gain in arms. . . . Whatever the nations think they need they must make for themselves." <sup>1</sup>

A State monopoly, with indemnities for dispossessed shareholders, and the restriction of the manufacture of portable weapons, rifles, pistols, explosives, etc., such is the system

<sup>1</sup> *The War that will end War*, published by Frank Palmer, London.

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advocated by the English writer. To it he adds the compulsory diminution of naval forces. When we enter the path of artificial compulsion we are led to proceed by degrees. All the same, it is doubtful whether these arbitrary measures are not more likely to further the cause of injustice than that of right.

In the first place, it would be a difficult matter to superintend and ensure their working in States anxious to evade them. Every one knows how easy it is to put our own construction on prescriptions of this nature by hiding our real aims behind prescribed appearances. The danger in Kruppism is the incentive to gain ; this tends toward an expansion of business when the gain rises in proportion. But it is also a spur to progress. The result will be that the State which keeps up a system of disguised Kruppism will most probably be the best armed, both in quality and in numbers, when war is declared.

But then, the objection will be urged, since commerce in war material is forbidden, there will be no more profits ! All the same, there will still be the armaments of the State in question, and doubtless also those of the smaller States which are themselves incapable of manufacturing engines of war on

## AN INADEQUATE REMEDY

the present enormous scale. Otherwise, by disarming them altogether, we should make impossible both their own defence against neighbours more powerful than themselves and the counterbalancing effect they are likely to produce by combining. Most likely the State nominally substituted for Krupp would supply them in his stead. It would be only an agent, though a very dangerous one! We see no advantage in such a system.

Nor do we see that the incitements to war would be appreciably lessened in this way. No longer do we make the mistake we made at the beginning, when we regarded the German aggression as decided upon by the high military command alone. Neither the Kaiser and his Court, the Prussian landowners, the industries directly affected, nor even the people of Prussia, bear this responsibility to the exclusion of the rest of the German Empire. It was the will of an entire nation, carried away by dreams of power and by greed. The very depths of human nature have been laid bare.

What Pan-Germanism has been in Germany will more or less be the force behind all future attempts at conquest: the growth and uprising of selfish passions in a race dazzled by its own might. We must recognize that



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mad infatuation of this kind is spontaneous, in nations and in men alike. Advice of an interested nature reveals its presence and stimulates its growth, though incapable of creating it. "The system of nationality," says Albert Sorel, "has already stirred up and will continue to stir up more wars than have resulted from religious quarrels in the past and from the ambition of kings in our day. The covetousness of nations is more bitter, their triumph is more overbearing and their disdain more insulting than that of monarchs; they also arouse a more bitter and lasting sense of resentment."

## CHAPTER III

### WAR THROUGHOUT THE WORLD

**L**ET us put aside dangerous illusions: war will come again and we must prepare for it. Consequently, it is most important to look ahead and try to see what new shapes it will take.

The first thing that strikes one is the generalization of the state of war. Coalitions of the past included but few belligerents. This time, two Germanic empires, after quickly recruiting Turkey, were joined by Bulgaria; they also cherished hopes of bringing in Greece, Rumania, Sweden, Persia, Mexico, and perhaps China. On our side, to the three Great Powers which took up arms in support of the Serbs and the Belgians, were added first Japan, then Italy, then Portugal; Persia, invaded by the Turks, was compelled to take sides. Semi-free countries also, Egypt, Canada, Australia, New Zealand, and even India, Tunis, and Morocco, are fighting for a cause which would appear to affect them but remotely.

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This character of political extension does not seem to be accidental. It is due to the fact that the present war had its origin—as will probably be the case in all great wars of the future—in a struggle between two principles of general interest. Arbitration eliminates all minor *casus belli*, and an even stronger curb is found in the complex interrelations of material interests, which extend far beyond national frontiers. The havoc wrought by war is so ruinous even to the victor, even to the onlookers who constitute the world's 'public opinion,' that it cannot be let loose from sheer caprice.

Political extension, too, is aggravated by geographical extension ; the whole of Europe may be said to be under fire and sword. The mobilization, however, of a Far Eastern Power like Japan, the intervention of the United States of America, the sympathy of the Colonies and the help they have given, have made this an intercontinental war. The naval conflict has spread to every ocean.

We may reasonably imagine that the youthful nations everywhere, whether independent or linked by colonial bonds to the older nations, will find themselves all the more necessarily drawn into future conflicts from the fact that their more diverse forms of activity and their

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wider external interests will compel them to remain less and less aloof from matters common to civilized mankind.

There is no longer room for the neutral, as facts clearly demonstrate. Look at Holland; it is difficult for her to remain unconcerned when her very existence, in spite of her neutrality, is doubly involved. The triumph of the ravaging Empires would mean the end of her independence; and well she knows it. Already there is talk of a Customs Union and its advantages: the beginning of the absorption process. How could one expect a Prussian conqueror, master of Belgium and aspiring to defeat the British Navy, to show any consideration for Holland?

Nay, the very fact of war has so profoundly affected the means of livelihood of the Dutch that they continue to exist only by permission of the belligerents. Nor is this permission always unrestricted. Great Britain has had to adopt special measures for allowing the transport by sea of food indispensable to the Dutch people, and of the raw material required by their industries. The German submarines, less solicitous about neutral interests, sink Dutch vessels.

Thus we see that the very existence of certain neutrals has become precarious. Only partially

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do they escape the evils of war. This is one reason that will induce them the more readily to incur all its risks, in order to have at all events some of the profits.

Nor is the case of Switzerland a less striking one. Completely surrounded by belligerents, she has had to entreat the Allies to allow free passage for the imported products she needs. But for this permission she would be reduced to famine. Thus Switzerland is unable to remain strict mistress of her own neutrality ; and since she depends to some extent on articles received from Germany, this latter country has practised a veritable system of extortion, selling her nothing except in exchange for part of the very products which the Allies allowed the Swiss to import for their own subsistence. We have here, in the world of commerce, an exploitation of neutrals, a method of evading blows which may be compared with the proceedings of German troops as regards women and old men, and which, at the same time, also demonstrates the dependence of these neutrals. What would have become of Switzerland if we had set forth like claims ? To avoid annihilation, she would have had to fling herself into the arms of one side or the other to purchase existence at the cost of her true freedom.

## WAR THROUGHOUT THE WORLD

Holland and Switzerland are exceptional cases, but Denmark, Sweden, and Norway do not find that everything runs smoothly. The most striking instance of all is that afforded by the United States. Not only was the freedom of their commerce attacked by German piracy, but also the lives of their nationals. As they form a Great Power, strong enough to treat with Germany on a footing of equality, and proud enough to defend their rights and prerogatives, the whole question had to be fought out. The difficulty of remaining neutral at once became apparent.

In the conditions created by new weapons of warfare and the complications of modern life we thus see that a war is no longer simply a local accident, a restricted evil ; it becomes a crisis that involves the whole of humanity.

## CHAPTER IV

### MORAL FORCES

**H**ENCE the importance of moral forces. At all times they have counted for much, though their scope was formerly much more limited. The moral faculties brought into play were less numerous and nearer to instinctive and almost animal-like reactions. The evidence of the most immediate interests, the compelling force of strict obligation, impelled citizens and soldiers alike against undisguised obstacles. In the present complex situations we need subtler instincts, more abstract principles, and an entire inner elaboration of public conscience.

Victory is first won on a non-material plane, that of public opinion. This is why belligerents make such efforts to convince the whole world of the righteousness of their cause. Call to mind the untiring character of German propagandism even in France: with the most ingenious persistency has the enemy endeavoured to prove that he was the victim of foul treachery and that Belgium must be held

## MORAL FORCES

responsible for her own misfortunes. Our neglect to refute these charges long injured us in neutral opinion.

Help from neutrals, financial, commercial, and even illicit, is too valuable to be lost by alienating neutral sympathy. Neutrals enter more into consideration of right and wrong from the very fact that, being less directly interested, they are the more impartial judges.

This initial sympathy is sometimes followed by decisive consequences when interests come to be attacked, either bringing the neutral nation into the fight or, on the contrary, keeping it out of the arena. The successive interventions of the King of Bulgaria and the King of Greece, both alike supported by a mere fraction of public opinion, are not forgotten. German propagandism had paved the way for this support.

True, there are two kinds of arguments, and that invoked by the King of Greece, by certain officers of his army and certain individuals in his political environment, was doubtless not so much concerned with Germany's righteous cause as with her military might. To afford the conviction that no reproach is merited is one moral victory; to give the impression that one's own side will be the stronger is another. As many hearts may



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be won by fear as by admiration ; as many lost by blame as by scorn. Not a single means of acting upon the mind has been neglected by our adversaries. According to their own account they are defending their national existence, which is threatened by an abominable coalition, and defending it not only with unvarying success, but by the most humane processes, against perjured and inhuman foes.

This incessant pleading has formed part of their attack, and has been carried on at great expense all over the civilized world by means of agencies, clandestine or official. German diplomatists of high rank and German business men have played their part side by side with the penniless and obscure. Great numbers of journals and periodicals have been bought over, new organs of publication have been established in Switzerland, Italy, Holland, Belgium, Rumania, Denmark, Poland, North and South America, and even in the invaded regions of France.

The persuasion of neutrals is not the only end in view ; a more important purpose is to shatter or to maintain, to inflame or to unsettle the *moral* of the combatants.

The first thing that matters is that the people at home should believe in their innocence, in

## MORAL FORCES

the purity of their intentions, in the continuity and extent of their victories and the certainty of their final triumph. In such times as these, when public opinion holds sway even in countries where the government is least democratic, no public effort can be made without general approval.

Besides the sacrifice of blood on the battlefield, so many demands must be made which closely affect the daily life of the community. Money comes first. Already war-taxes are accumulating, with the certain prospect of still greater burdens after the war. But it is not the State alone that asks for our money ; the cost of every kind of commodity increases ; commerce, crippled by the demands, orders, and exigencies of war, makes the public pay for the services rendered to the army ; nor can we leave out of account the profiteering and speculation encouraged by so mighty an upheaval. Then living becomes dear, the first and inevitable form of taxation. A people will only tolerate these increased burdens for any length of time if it is inspired with a firm conviction of the justice of its cause, an unshakable confidence in ultimate victory.

As if the evils to which we submit from compulsion were not sufficient, there are others which we accept willingly : after taxes come

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loans. Though these are not always recognized as an evil by private individuals, they nevertheless weigh heavily on the nation and fall indirectly on the shoulders of the tax-payers and of the loan-holders themselves, or of their descendants. Here, more than anywhere else, the Government needs to inspire confidence. The formidable expenses of modern warfare far surpass the resources of the budget, however inflated by the most skilful tapping of the wealth of the nation ; the final result is that almost everything depends on credit, *i.e.* on the confidence inspired in the onlookers, especially in one's own countrymen: the latter, first because they are only too keenly interested in upholding the national cause, and secondly because they are the most easy to deceive. The censorship is pre-eminently a financial instrument. The day may come when the belligerent populations on both sides will be reduced to a state of complete ignorance of real events. Men will borrow, obey, fight, suffer, attend to the wounded, and die, with their eyes closed to the real facts. It is of more importance to prevent the intrusion, by way of neutral frontiers, of uncensored newspapers and information, than that of the most dangerous engines of material destruction.

The result is that even military operations

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are frequently moulded by the necessities of a financial policy rather than by the rules of efficient strategy. A battle is fought to ensure the success of a loan, when the latter cannot be floated without a victory to back it. The attack on Verdun in February 1916 was considered at first, as perhaps it really was, the bloody cost of the issue of the Kaiser's fourth loan. We must cultivate the opinion of those from whom we are so frequently compelled to ask for money.

Yet how often do we hear that the money question is not the paramount one, but that lack of freedom in the thousand details of our daily actions, and the restrictions of all kinds under which we live, constitute an atmosphere of repression which soon becomes stifling! The requisitioning of food-stuffs and metals, the destruction of cattle, the compulsory war-bread, the presenting of special cards and permits at every step, etc.—a leaden cloud made of all these weighs us down. How can it be borne except by maintaining a steadfast faith?

Finally, the necessity of carrying conviction is even more evident in dealing with the soldiers: one cannot fight heartily for an unjust cause, or for one that is hopeless.

As moral forces weigh so heavily in the

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balance, we naturally aim at lightening the enemy's scale as much as at loading our own. A sense of discouragement must be instilled into the hostile nation, so that it may spread to the army and induce the people to demand peace at any cost. The official *communiqués* are framed with this end in view ; insidious items of information are launched by way of neutral countries. Attempts are made to utilize private friendships of long standing : these serve as a pretext for biased correspondence which we are requested to pass on to others in our immediate neighbourhood. Underhanded attempts are made to organize petitions by mothers against the continuance of bloodshed. Every method is tried.

This is because war has never to such an extent been waged by the entire nation, been waged by the spirit.

Nor, indeed, has it ever made such demands upon the spirit.

Who predicted that men would become effeminate and pusillanimous with the sweets of civilization ? A pessimistic remark, emphatically belied by events. It is doubtful if any period in history has ever witnessed like heroism. This is proved by thousands of letters and narratives, official reports and

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quotations in standing orders, by the daily spectacle of these hundreds of thousands of heroes scattered among the armed forces of our few millions of men. Heroes as brave as d'Assas now abound. Deeds unequalled in fiction, a single one of which would have glorified an entire period of history, are now manifested everywhere around us. Sublime is the age, sublime the race! Nor do the ranks of our allies—and those of our enemies—lack instances of a courage equal to that shown by the bravest soldiers of any period. No, the new warfare is not that of men rendered effeminate by ease and comfort. Nor does anything warrant our belief that the future will be less fruitful in heroic deeds than is the present. Rather is it likely that each generation will prove superior to its predecessor.

Nowhere do we see, not even in the colonies, that barbarity is a condition of true courage. It frequently accompanies violence; but savages and aboriginals are, in a sense, but feeble creatures.

When it is a matter of resistance to fear, of acceptance of sacrifice, of endurance of hunger, thirst, and fever, of daring the unknown, of refusal to withdraw before the most overwhelming odds, of dash, steadfastness, and determination, we find that a town-

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bred European is superior to a bush-reared negro. A refined and scientific education has forged a richer and stronger nature than virgin forests could have produced. The rule of the mind over the body is a product of civilization, and doubtless it increases with the development of the mind.

When we invited colonial contingents to fight for us, when sturdy Moors and Indian Gurkhas, trained to be warriors from earliest childhood, had to face the awful deluge of fire and steel pouring upon our trenches, it was felt that they had slowly to be broken in to the roar of the cannon and the many surprises of the new mode of warfare. Only the civilized possess a spirit tempered to fight the civilized.

Nerves of steel are indispensable. Nor can the power of resistance be cultivated through passive insensibility. Even a deaf and blind man would feel the shock of a bursting shell. The impassiveness shown by our soldiers is an active virtue ; each moment of their unruffled calm represents an inner victory won by will-power. "The most difficult thing we have accomplished," writes one of them, "is neither prolonged marching, the taking by assault of some position or village, nor the defence of a wood—though these are almost daily occurrences

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for our battalion!—it is the fact that we remained, north of Ypres, twenty-three days and twenty-four nights consecutively under a hail of bullets and shells *without flinching*. The 'music' did not stop a single moment: the sound of the whistling projectiles set our nerves tingling and our bodies quivering all over . . . the heavy bombardment sometimes shaking us to such a degree that every muscle in the body kept on throbbing for several minutes afterward."

On first reaching the front, some of the men are filled with panic at the sound of each formidable explosion; they quickly master their feelings, however. Amid the roar of cannon, with the dead and the dying all around, they are not only impassive, they are even gay. With a jest on their lips they hurl themselves into the deafening storm of missiles and laugh at death. Their dash and self-possession, their spirit of sacrifice, have the most sublime origin; they are born of a chastened ideal, a profound sense of right, a clear and complex grasp of international problems. Their citizen conscience is the secret of their heroism.



## CHAPTER V

### ANONYMOUS WARFARE AND THE NATIONAL SPIRIT

**T**HIS consciousness gives the present war a character of its own: one of individual disinterestedness. In former times, armies were often composed of slaves enrolled by force and advancing in obedience to orders. French history tells of bands of mercenaries, then of professional soldiers, rewarded either by plunder and carnage or by promotion and pay. Finally came the era of the nation in arms. But even then, how many brilliant deeds were inspired by a desire for glory! During the latest European and colonial wars the Press never failed to publish, with innumerable and full details, the names of victorious generals as well as those of officers and individual corps that had distinguished themselves.

The present struggle, on the other hand, was at first almost entirely anonymous, but no one dreamt of complaining. We are not to know on what front are mobilized our relatives, or the

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names of their commanding officers. The great deeds mentioned in the official *communiqués* are but a faint echo of what might have been given; they state as few details as possible. Many a hero, describing for the benefit of his fellow-countrymen the worthy deeds of valour he has witnessed, mentions neither his own name nor those of his comrades. The interests on behalf of which one dies are too far above all petty individual ambition, and this sacrifice is willingly added to the rest. However great he may think himself, the individual becomes merged in the Nation.

Combats are nowadays very different from the battles of the past, with their stage-setting of glory. A general, gallantly plumed and with a brilliant staff around him, would ride on to the battle-field, and before nightfall the face of the world would be changed.

The *generalissimo* was himself a fighting man. He added the prestige of physical courage to his reputation for sudden inspiration and strategic genius. He saw his entire army manoeuvre, charge, and triumph. Every phase of the operations was followed through a field-glass, and the eye of genius discerned victory and grasped it on a single sunlit afternoon.

Our *generalissimo* is the head of a great

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enterprise, like the owner of a works or the chairman of a board of directors ; he is a business man who, if necessary, might control and direct the war from Paris, sitting snugly in his own room. He goes through returns, receives reports and signs documents ; his medium of communication is the telephone. His battle lasts weeks and even months, he sees it only on the map. His heroism is that of a politician : a blend of cool confidence, reasoned will, and the courage incumbent on responsibility.

The general's virtues, like the soldier's, are analogous to the unpretentious activity of the citizen ; their glory resembles civic glory. As a matter of fact, renown or fame, which no longer attaches to warriors as in the times of the *Iliad*, to knights as in the Middle Ages, or to leaders of men as in the pre-Napoleonic days, has ceased to illumine the names even of great organizers, rivals of Carnot and Moltke. No individual *rôle* commands attention. Heroism is collective ; the honour of preparation falls to assemblies prompted or inspired by political groups and by the electorate.

Some sacrifices are more difficult to make than that of life : the sacrifice, for instance, of our preferences and our passions. While combatants showed themselves willing to forgo the supreme reward of glory and efface themselves

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behind a common and anonymous discipline, political parties also acted up to their patriotic duty and spontaneously acclaimed 'the sacred Union.' At once they put an end to divisions and disputes, to irritating controversy of every kind: not a trace remained of pre-war anti-militarism; everything was subordinated to the public welfare. This, indeed, is a trait common to the various belligerents. In England Liberals and Unionists work together in apparent concord. In Germany the Socialists have given the military power their undivided support. In Russia, as in France—even more than in France, alas!—the nation was unanimous in its attack on the scourge of alcoholism. This state of things is too widespread not to be the result of causes independent of our own position.

Remember that a century ago, in the wars of the Revolution and of the Empire, neither the intoxication of conquest nor the horror of invasion had succeeded in effecting a like unanimity in France. There were always found parties eager for the success of our enemies; and, what is more, ready to further that success. To what is the difference due?

Assuredly to the evolution of social life under the influence of material progress. Of this a two-fold proof may be adduced. The reason why each

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people gathers closer round its flag than in former times is that it realizes how much more deadly the threat of war has become. Conquest has assumed a new meaning now that scientific cultivation and intensive underground exploitation have given coveted territories a value formerly unknown. Then, the conquest of a province signified a nominal change of owner, not a profound change of life; conquest was political, not social or economic. The population remained where it was, as it was; life went on just as before.

At the present time, owing to the mobility of the inhabitants as well as of the capital of a nation, the dwellers in annexed regions must expect either to be ousted or exploited. A blow will be dealt at their property and private life, at the very race to which they belong. Their commerce will forcibly be diverted into other channels and a ban put on their language, for every element of production will be absorbed by the collective nation. The development of intercommunication has inevitably brought about the unification of interests on a large scale.

The victor is not content to take the vanquished as a partner, he devours him. And it is the lure of so profitable a prey that rouses the spirit of conquest. If you make no attempt at

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self-defence, you know that you risk something more than humiliation : dismemberment in the first place, and subsequently partial destruction of the race.

Since the times of the Revolution a great idea has arisen : the polity of nationalities. It originated in a strong consciousness of racial ties. In this new world the race has acquired a personality and a reality hitherto unknown.

Is not this the result of the new solidarity created or rendered perceptible by innumerable relations which were absent from life in bygone days ? Facilities of transport and intercourse have brought about as a reflex the necessity of entering into varied relations and a continual exchange of ideas. The peasant of old lived all alone on his plot of ground ; his fields were the horizon of his world ; he subsisted on his own produce. The modern farmer, on the other hand, has become a business man, compelled to buy and sell, to keep himself well informed, and to act in co-operation with others. He reads and travels ; he is far more deeply rooted in his environment. The ebb and flow of public opinion affects him daily as he merely scans his paper. The consciousness of his share in the national life has entered his soul, never to depart.

However it be, the cohesion and moral con-

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centration of the belligerent nations is manifestly one characteristic of the new warfare. It carries them in the direction of a political concentration, indicated by the constitution of 'coalition' ministries. By common consent, the governments thus formed receive extended powers. The logical outcome of such an evolution is a return to the dictatorship of a past age.

It is well known that this magistracy, instituted at a time of national peril, was alike absolute and ephemeral. Thus poised, the institution could be effective without producing tyranny.

In an emergency, what form would a dictatorship assume in the present state of political life? We have seen that of Gambetta in 1870. Founded on his eloquence as an orator, it galvanized all France. By the supremacy of a single individual will, the inner forces of a nation can most effectively be wholly brought together and set to work, continuing to the very end without loss of power.

## CHAPTER VI

### THE MOBILIZATION OF AUXILIARY INDUSTRIES

WE must ask the reader to take us quite literally when we state that the whole of the living forces of the country are absorbed in war.<sup>1</sup> Consider how far we have advanced during the last half-century. In 1870 France had mobilized eight hundred thousand men, Germany one million five hundred thousand ; this time the figures were probably close upon five million in France and nine million in Germany : more than a

<sup>1</sup> The ideas expressed in this work have been deduced straight from the facts, though certain of those contained in the preceding chapters show that these facts agree with the forecasts of several military theorists, more particularly of Jean de Bloch. As regards the social aspect of war, I had not read the fine volume of M. Alphonse Ségur, entitled *Guerres d'Enfer*, when my ideas on the same subject appeared in the *Revue des Deux Mondes*, January 1916. My article embodied notes and thoughts jotted down in the early months of 1915, shortly after the battle of the Marne, and had been received at the offices of that periodical before the appearance of M. Ségur's book. The coincidence only makes more positive the conclusions reached by both of us. These concern most intimately the future of France, and I am naturally delighted at finding them defended by other pens than mine.



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quarter of the entire male population. Serbia, a small people numbering scarcely three million inhabitants, was able to range in battle armies amounting to half a million men. Youths are recruited at the age of eighteen, and men up to forty-seven or forty-eight; in Austria perhaps even up to fifty. Within a few months a total of about thirty million Europeans were summoned to arms. This figure alone shows us that the expression 'a nation in arms' is no longer an extravagant figure of speech, it is nothing but the strict truth.

This, however, is but a part of the forces employed in war, though, indeed, the part most in evidence. Formerly the army, with its military *personnel*, was almost self-sufficient; at the present time, huge public departments have been militarized and organized for war purposes.

First, the railways; the initial concentration and mobilization of our troops alone have necessitated thousands of trains. They are needed for every advance, withdrawal, or lateral movement. The services in the rear—supplies, munitions, reinforcements, wounded men—keep the lines permanently busy not only at the front but right back to the very heart of the country. Consequently, there is an entire staff attached to the army for purposes of transport by rail.

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Analogous are the sanitary and medical services. Controlled by the army doctors, this department finds employment not only for a strictly military but also for a semi-civilian *personnel*: a large and effective force, especially in auxiliary hospitals. Thus we have non-mobilized local surgeons, voluntary nurses and orderlies, Red Cross ladies, boy scouts, etc.

A third class is engaged in munition work. The public arsenals employ workmen who are sometimes under military rule and whose numbers are largely increased in war-time. Arsenals, however, are insufficient; in every belligerent country the widest appeal has been made to private industry.† An article which appeared in the *Thurgauer Zeitung* at the end of 1914 stated that the number of Krupp's workmen at Essen had risen from forty-two thousand to sixty thousand since the opening of hostilities. Everything in the form of a machine workshop or a chemical works, or that could be transformed into either of these, has been either requisitioned or invited to take a share in the manufacture of munitions. All over the country are being made fire-arms, projectiles, trench-digging tools, barbed wire, motor-cars, aeroplanes, uniforms, tinned food for the army, etc., etc.

Thus we find, along with those who are

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mobilized, great numbers of workers not only paid but frequently controlled by the war, indispensable to its success and devoted to the national task. Those exempt from military claims, either by reason of age or of ill-health, are invited, as also are foreigners, to collaborate voluntarily in the defence of the country. Nor do the public powers officially, and corporate bodies in their private capacity, fail to put the requisite pressure on shirkers.

In England Mr Lloyd George had to organize intensive recruiting of the 'industrial army,' with the help of the Trade Unions. In London hundreds of offices were opened in Town Halls and Labour Exchanges. Those who enrolled themselves undertook to work for a period of six months under the control of the Government, wherever the latter might send them; and, if the conditions of engagement were broken, to recognize the jurisdiction of a special court. Moreover, another law ordered the preparation of a national register, so that all who were fit might be called on either to bear arms or to help in the production of war material.

Thus along with compulsory military service to the age of forty, which has now become law, compulsory industrial service is implied, potentially at all events, in the British organization.

Indeed, a threatened nation may be com-

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pelled to requisition labour, for huge production becomes a public necessity. The question is perfectly simple and clear in the case of workmen already mobilized, who from the front have been sent back to their workshops. On resuming work at their trade they remain under military law ; they do not cease to be soldiers ; they are soldiers in a latent state, to adopt a medical term.

Because we did not foresee how enormous would be the expenditure, especially of projectiles, we had neglected, in time of peace, to provide for their manufacture by auxiliary plant. Even in the calculations of the State arsenals far too narrow a margin of their own *personnel* had been retained. The consequence was that large numbers of workmen had to be brought back from the front. To provide private works with a fresh supply of labour is an even more difficult matter. Disorganization is then inevitable. Far better that there should be no need to call anyone back.

In fact, those who have technical experience in the various branches of activity indispensable to warfare—engineers, managers of works, foremen, specialists in some particular industry, private surgeons, radiographers, etc.—are now more usefully employed in carrying on their own work than on the battle-field.

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What has been done in the case of the railway workers should also be done in a dozen other trades ; on the declaration of war, the men, whatever their age, ought to be mobilized in their own special work and drafted at once into some employment where their efforts can best be utilized.

This assumes the preliminary compilation of a systematic mobilization list, dealing with all the auxiliary industries engaged in national defence. Having neglected this precaution, the French have been compelled to seek out and send back to the rear, after a considerable loss of time, those who were manifestly needed there. Endeavours were made to replace the rest. The work was carried out very imperfectly, and we shall have to suffer the consequences right to the end.

All this clearly proves that, in view of the ever-increasing expenditure of material which future wars will call for, we cannot avoid such an extension of compulsory service as will involve the industrial equipment of workshops and manufactories.

## CHAPTER VII

### THE MOBILIZATION OF COMMERCE

**T**HINGS will not stop here. However desirous we may be of preventing it, innumerable business transactions are bound to become more or less intimately concerned with warfare. Only by an intense flow of importation does the State maintain its stock of provisions and raw material. The majority of its orders are given to private dealers, with whom it generally draws up long-period contracts. It is to the interest of the State to leave at their disposal the men they need to serve it.

Thus, in France, conscripted seamen engaged in commercial navigation have not been summoned back to the flag. Not content with facilitating the recruiting of the *personnel*, and actually supplying it in case of need, the State, by means of its navy, assures the protection of the mercantile fleet, even outside home waters. After giving its orders and deciding upon freight and route, it dictates to the owners the safeguards to be adopted

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in order to avoid danger. In France and England alike it supplies ships with anti-submarine guns. It exercises all the more detailed and careful supervision over ship-building because the merchant fleet is a most important instrument for the direct supply of national needs.

M. René La Bruyère, a naval commissioner, wrote as follows in the *Revue des Deux Mondes*, 15th March 1916 :

“ Whether requisitioned by the State, or remaining at the disposal of their owners, almost all merchantmen have been brought to participate closely in the task of national defence. In former times letters of marque were entrusted to privateers, who preyed on the enemy on their own account while serving the King's interests. By abolishing this practice, the Declaration of Paris seemed to have drawn a distinct line of demarcation between the ‘ war ’ ship and the ‘ merchant ’ ship. Our diplomatists flattered themselves that they had safeguarded individual property by all kinds of protocols. As it happens, never before has private property suffered greater loss ; never has there been greater confusion between the national and the private flag. It is, indeed, a question at the present time whether we

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are not moving in the direction of complete militarization of the merchant fleet."

Indeed, during the greater part of the war, about fifty per cent. of the French marine has been requisitioned and placed under the direct control of their Admiralty. The tonnage of small companies has been requisitioned in some cases to the extent of one hundred per cent.

Between requisition and the militarization which is often its necessary consequence there are, however, several degrees. Besides auxiliary cruisers, auxiliary scouts, and hospital ships, which retain their autonomy and come under the *régime* of the navy, besides smaller units attached to existing groupings—such as auxiliary harbour tug-boats, steam-tugs of the Naval Division attached to the Dardanelles and Salonica expeditionary corps, such as sweepers of sea fronts, and the coast-patrol trawler squadrons—there are coal and petrol boats, vessels carrying provisions and goods between France and oversea troops, transports for soldiers and munitions, etc., which retain their mercantile crews, either under the management of the State, or under that of the owners, though at the expense of the State.

These latter vessels have not the right to



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hoist the naval pennant, though they are in the service of the navy and the army. Others again, although theoretically unattached, lend their help in the transport of troops. It was thus that at the beginning of the war the mobilization of the French 19th Corps was effected ; it was conveyed to the Belgian front with amazing rapidity. In a report on requisitions, dated 26th March, 1915, M. Bouisson, member for the Bouches-du-Rhône, stated that during the single month of August the Compagnie Transatlantique made 78 mobilization voyages, transporting 48,762 soldiers to France and 16,187 to Algiers and Tunis, a total of 65,000. From the 1st of August to the 31st of December, 1914, this company carried over 100,000 military on the Mediterranean routes alone. Over the same system it assured the transport of 7750 horses, 400 motor-cars and lorries, 37,655 tons of cereals, and 16,390 tons of war material.

As for the simple cargo boats which ply to and fro on entirely private business, when they were compelled to arm fore and aft against submarine attacks it was found necessary to embark naval gunners with orders to fire only in self-defence. They are on board as the representatives of the Admiralty ; they constitute a garrison, and yet form part of the crew.

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Lastly, the fact that civil populations have to be supplied with food gives the mercantile marine an altogether special importance. As we see, maritime transport is very largely devoted to the public service ; almost everywhere it bears the stamp of this in the status of its staff.

We shall be led to deal in a like manner with other industries, such as mining. The State, by assuming control of their productive effort, which conditions the operations of its armies, makes them, so to speak, an expansion of military activities.

Even now we see that German submarines no longer distinguish between war vessels and merchantmen ; the destruction, too, of coal-mines and manufactories is clearly an integral part of the new strategy, for which it becomes an end in itself. Everywhere attempts are made to destroy the crops or to raid the provisions of the invaded countries.

Thus the peaceful occupations of commerce and industry are voluntarily torn from the sphere of private interests, once respected in war, to be flung, as human life and property have been, into the devastating whirlwind.

Everything keeps alive a state of confusion ; there is nothing strictly private nowadays. As both soldiers and civilians have to be fed

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and clothed, warmed and kept under cover, all sources of production, one after another, become national concerns. In order to carry on the struggle longer than the adversary, it is important to retain in their occupations a certain number of fishermen, cattle-breeders, farmers, and agricultural labourers, etc. Consequently the various tasks ought to be distinctly assigned beforehand, each man, in all essential trades, having his allotted part and his instructions, as in the mobilized army.<sup>1</sup> On the day when one of the belligerents shall have thus completely organized the arrangement and disposition of its human resources, it will derive thereby such power of resistance that its rivals will be compelled either to imitate it or to lapse into a fatal inferiority.

<sup>1</sup> The German general in command of the Westphalia and Lower Rhine districts laid down for the firms engaged in work for the army the two following rules: It is forbidden (1) to give employment to any workman who may leave his employment to obtain higher wages; (2) to offer employment to workmen engaged in other similar establishments.

## CHAPTER VIII

### THE ORGANIZATION OF SUPPLIES

ONE consequence of the same need is a new *régime* for the supply of all necessities, including plant and raw material. When mobilization takes place, not only horses and carriages, motor-cars and aeroplanes, will be requisitioned, but also such standing machinery as is suited for the manufacture of useful products, as well as stocks of flour and corn, sugar, coal, and metal.

All this is already practised in Germany, to a greater or less degree. It began with an order dated the 24th August, 1914, followed by another of the 15th October, compelling all merchants or growers to declare the quantities of goods in their possession or keeping, together with a statement of unfulfilled contracts. This applied to *all articles serviceable in war, as well to the raw material from which these articles are made* ; more especially to products of prime necessity used in feeding men and horses, as well as the raw products of the soil, fuel, lighting material, etc.

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Another order dated the 2nd February, 1915, repeating this compulsory clause and threatening search warrants and the ensuing penalties, decreed the general seizure and appropriation of all stocks and supplies of copper, nickel, tin, aluminium, antimony, lead, and alloy. By virtue of this seizure, the ownership of all this material passed into the hands of the State or of a company created by the State, and acting as its agent: the War Metal Company. The previous holders retained provisional charge of the stock until it should be requisitioned. On the 15th November a War Office decree ordered delivery of a large portion of the metal goods, especially of copper utensils.

As regards fodder, molasses, and all agricultural and industrial produce used in the feeding of cattle, the German command issued a series of orders along the same lines. Oats and barley were appropriated, and no sales of these foodstuffs were permitted except through the Army Food Company.<sup>1</sup> Other food supplies utilized for cattle can be sold only to the German Growers' Supply Company. In each category, every one is compelled to inform the Company of the quantities at his

<sup>1</sup> Similar measures in the case of oleaginous grains were initiated on 15th July, 1915.

## THE ORGANIZATION OF SUPPLIES

disposal and those indispensable to the producer for his own consumption. As for the Company, it may deliver goods only to the communal associations and the departments appointed by the Chancellor; these must make local distribution according to need. And finally, no cereals from which bread can be made may be utilized for feeding cattle. . . . Moreover, by an order of the Federal Council dated the 19th June, 1915, all contracts entered into by private individuals for the purchase of the forthcoming crops of wheat, rye, barley, sugar, etc., are cancelled. All the rice must be reserved for the Central Purchasing Company, etc.

The potato, an important article of diet, was made the subject of special regulations, beginning on the 5th of August, 1914, with the compulsory centralization, in the hands of a privileged company, of all products of dried potatoes.<sup>1</sup> There are many of these regulations, dealing both with cattle and with bread.

The supply of the latter has called forth the most striking measures. First, it was made obligatory to include at least 30 per cent.

<sup>1</sup> On the 12th April, 1915, there was created for the supply of potatoes an Imperial department which has a pre-emption right on all current contracts.

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of rye in all wheaten bread, then 10 per cent. and 20 per cent. of potato flour in rye bread. Moreover, restrictions as regards sales and working hours were imposed on bakers. The communal authorities were commissioned to undertake the rationing of the people. For this purpose they issued the famous bread-cards; no one was permitted to consume more than 225 grammes, subsequently reduced to 200 grammes of flour per head. This, with the addition of potato starch, corresponds to a little more than three and a half pounds of bread per week. By an order dated the 28th of June, 1915, all cereals capable of being converted into bread were requisitioned for the benefit of the communes.

The production of sugar and the brewing of beer have also been restricted, and the malt trade centralized. A census of cattle, more particularly of pigs, was taken, and, after requisitioning a portion as food for the army and the people, the authorities decided to sacrifice a certain proportion of the rest, viz., 30 per cent. of the pigs, at the beginning of June 1915, in order to avoid the loss of consumable matter which would have been used in feeding them.

To sum up, all traders and producers, as well as a large number of private individuals,

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have been subjected to inspection and requisitioning on the part of public officials as regards most articles of prime necessity. Visits are paid from farm to farm and from shop to shop; the officials have taken whatever they pleased, arbitrarily leaving behind such varying quantities of stores as were considered necessary for the owners' personal consumption, or for that of their animals.

When requisitioning was not considered advisable, as in the case of certain cooking utensils, of gold, rubber, etc., an invitation was sent out for voluntary contributions of all available supplies.

Consequently the State or its agents have found themselves saddled with the task of concentrating and distributing a formidable quantity of stores.

The reason why these conditions, so novel in their severity, have prevailed in Germany more than in other countries, is to be found in the almost complete blockade to which she has been subjected, and the special efforts made to exhaust her resources. The case of Germany is, however, not so exceptional as might be thought. The Allies, while continuing to enjoy the freedom of the seas, have all the same been subjected to considerable inconvenience in obtaining fresh supplies of



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certain raw materials. While the risk of complete scarcity has threatened our enemies, all the belligerents incur the risk of comparative scarcity and an inevitable rise in prices ; these react both on their industrial activity and on their financial stability.

Now, a war is a protracted affair. Scientific progress, whatever may have been said about it, does not shorten war ; it would rather seem as though it must prolong it. This is a point we shall examine shortly.

We may at once say that the actors in these mighty dramas are the first to be mistaken regarding them. To them it appears impossible that such a cataclysm should be prolonged ; at first they see nothing but a sudden passing crisis ; the problems it raises are solved by temporary measures. They act for the moment, undertake tasks impossible to continue for any length of time, carry away a few clothes as though they were to be back again within a few weeks, leave home as did the refugees of the Revolution, expecting to return almost immediately. Then the war settles down like a chronic disease, and everything connected with it, even death itself, proceeds on an even course. One becomes accustomed, or at least adapts oneself, to the changed conditions ; and when peace is finally declared,

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it too creates amazement and confusion in turn ; it produces a fresh crisis.

Success will be the result of all national activities raised to their highest degree of intensity and duration. Any negligence, any defect in organization which slackens the output of some important industrial product or lessens the financial reserves of the country, and consequently its power to endure a protracted war, will prejudice its best chances of success. Those who succeed in avoiding these defects will sooner or later win the victory ; their rivals, whether they wish it or not, will be compelled to imitate them.

War is a form of competition. It obeys the general law, and the first to employ a more efficient process than the rest compels everybody to follow suit. Thus there can be no doubt but that war, by carrying out its natural evolution to the very end, must some day lead to the complete absorption of individual civilian activities into public action for the national safety.

## CHAPTER IX

### THE ABSORPTION OF INDIVIDUAL LIBERTIES

**W**E are now about to arrive at the same conclusion along other channels, and we shall discover that our findings apply not only to action and property, but also to persons. Not only do production and commerce—*i.e.* the public side of private life—come within the range of public concerns, but also the strictly private domain, the liberties of consumer and proprietor, the position of individuals, and lastly, their disposal of themselves.

Rationing, the regulation of the ingredients of bread, the prohibition against feeding cattle on certain products—all deal with the first of these three points. German housewives have been strictly ordered to make a radical change both in their menus and in their methods of cooking. Compulsion has even been applied: for instance, in Germany it is forbidden to eat sausages for lunch. In many parts, and even in Berlin, meat has come to be allowed only on two days a week. From

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the 2nd September, 1915 onward, pastry-cooks were forbidden to use unskimmed milk or cream; cream might not be sold in hotels or restaurants, etc.

Moreover, from the 31st March, 1915, all land-owners, tenants, or holders of property in Germany who had not given proof of their ability to sow the land effectively were deprived of the use of it until the end of the war; it was handed over to the commune.

The other belligerents also have seen some of the effects of rationing: in France the scale of flour extraction was compulsorily raised to 77 per cent. by a law dated the 26th April, 1916. At the same time, the milling of any but 'whole' flour was prohibited, ruinous though such a measure might be to the pastry-cook's business. It was also forbidden to use flour or bread in the feeding of animals.

No need to mention the various taxes imposed upon commerce. In addition to these, the retail dealers have been forbidden to sell more than a given quantity at once of a particular commodity to the same person. Three great dangers had to be kept down: waste, hoarding, and immobilization.

When it is desired to regulate more closely the rational use of various articles of consumption, sterner measures will have to be

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employed. More and more frequently will the central or local authorities have to guarantee the subsistence of the people, or at least some part of it. This can be done only by an official system of distribution.

Official supervision of individuals has become general in France only in the matter of passports. This is due to espionage, which has and must have far-reaching consequences.

The importance acquired by this poisoning of the body national is well known. Espionage consists not only in giving information to the enemy, but also in affording him assistance by secretly plotting to destroy bridges, railways, constructions, factories, boats, and other elements of the material equipment of the country which it preys upon, or to ruin its human forces by spreading abroad moral, intellectual, and even material poison. In times of peace it was espionage that prepared, in front of our citadels, concrete platforms for German big guns, and in our quarries dug-outs for the Kaiser's regiments. The present war has revealed the powerful effects of a scientific pre-war organization.

During mobilization the attempts upon the French railways did not succeed, but they might have caused serious delay. All our plans would seem to have been known to

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Germany, sometimes even as soon as they were formed.

In the accounts from the front, we have read of the innumerable methods used by German spies to inform hostile observers of the strength and the movements of our troops, or to direct the firing of their own. Lights in top windows, conventional signs shaped by hanging out articles of attire or by opening and closing certain windows, inscriptions on the inner side of shutters suddenly turned outward, silhouettes outlined by the teams of a pretended ploughman, etc., etc., all kinds of treacherous ruses were put into practice. In the homes of many suspicious characters have been found wireless telegraphic apparatus, sometimes concealed in the most ingenious fashion. Did not the Italians discover one in the altar of a small church in the Trentino, where it had been hidden by the officiating priest himself !

Posters of German companies, extolling harmless products, bore marks intended to direct invading troops or to supply certain topographical details. In every locality entered by the invaders they were guided by some one formerly employed in one of the main business firms of the place, by some overseer or engineer of the local works, who had been

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treated as a friend, for years in some instances, right up to the day of mobilization. These men went straight to the residences of the men of note in the town or village, knowing their position and resources, and gave detailed information regarding the horses in their stables and the wine in their cellars.

Espionage had filtered through every pore of the country. Consequently, a strict watch is necessary even in times of peace, and naturally even more so in war-time. Surveillance is discipline: it takes for granted both a knowledge of individuals, acquired by more or less complicated formalities, and certain impositions, or at least prohibitions. When surveillance becomes closer, obligations to refrain from acting are succeeded by obligations to act. To be recognized as a friend, each man must give certain proof; the simple and precautionary passwords are supplemented by the external tokens of brigade formation, which ensure cohesion.

Frenchmen who either are or appear to be mobilizable have been requested not to appear in the streets without identification papers. A like system might easily be applied to all, men and women, young and old.<sup>1</sup> There

<sup>1</sup> Individual pocket-books for civilians, containing photograph and finger-prints, have been proposed.

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might conceivably be appointed a numerous staff of inspectors, unpaid for the most part ; they could make really effective a system of surveillance which has hitherto, in France, been in a very rudimentary condition.

Recognition and identification of suspected persons, however, is not sufficient ; the information obtained must be brought together, collated, and utilized ; it must be interpreted and acted upon locally. This involves much organization, leading gradually to the grouping of the population within the meshes of an ordered and graded system.

The same need to distinguish, in the masses of the people, between the unassimilated foreign elements and the native or really assimilated elements has brought about a revision of the naturalization law. There is a tendency to do away with the confusion which arises when a French family of long standing bears a German name, by giving the family name a French form. National characteristics are being strengthened by every possible means, especially by a sort of Gallicizing of name endings, which has its analogy, on another plane, in the uniforms of the various troops.

Private life, too, is affected as regards the secrecy of the postal service. In war-time



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the claims of the censorship are unanimously conceded; it is felt that they answer to a public necessity. Letters have even been systematically delayed and at times suppressed; combatants have been prevented from informing their families as to their whereabouts—quite a reasonable measure. And not only have there been obstacles to the exchange of ideas, but even persons have been prevented from travelling, more particularly in the army zone, though also in certain important regions of the interior.

## CHAPTER X

### THE NATION IN TUTELAGE

**T**HUS we see that the protection of public interests makes necessary an ever-increasing infringement upon private liberties. The protection of private interests contributes to the same result.

A part of France is invaded ; refugees flee from their villages ; the local authorities, who have forced them to evacuate the threatened localities, send them to other districts to be distributed among the inhabitants ; they must be provided with temporary shelter and lodging, help must be given to those who have no means of subsistence—consequently, their numbers must be ascertained ; also precise information as to their capacity for work, so that this may be utilized with the least possible waste.

To meet such emergencies, a department should be created to tabulate beforehand all the necessary information. Registers should be kept of the effective supply of non-mobilized workers, according to profession and commune,

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with full details as regards the places open to them in the interior of the country.

French legislators have recently acknowledged a new right : the right to compensation of every civilian who is a victim of the war. It is on the nation's account that he has been compelled to suffer in person or property ; in him the nation itself has been struck ; he has paid for his fidelity to the flag. The devastation caused by armed troops is a sort of requisition which should not remain without compensation. Those who live in the fighting zone are the only people—or almost the only people—subject to this calamity ; they suffer while protecting the rest. National solidarity requires that they should be indemnified for their losses, and that every citizen should bear his share in the ruin caused by a war, since he will profit by any benefits arising therefrom.

Hence there must be public examination and valuation, public assistance and fair compensation ; hence, also, the right and duty to control. For if the State assumes responsibility for losses, it must exercise certain precautions. The attitude of the people is bound up in it to some extent : materially, since the State will pay ; and morally, because of the consequences.

Indeed, along the entire fighting line the population is kept in a condition of strict

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tutelage by the troops ; less and less can it maintain an independent existence. Supplies and resources of every kind are wholly requisitioned ; wood serves to prop up trenches ; doors even are taken down to cover them, and chairs carried off to furnish them. The civilians have to be supplied with food by the army. They are no longer their own masters ; their houses become works of defence, exposed not to an occasional volley of rifle fire, but to utter destruction from the projectiles hurled by heavy artillery. Whether they wish it or not, they become involved in military action. They suffer as do the soldiers ; they collaborate with the latter behind the fighting line.

After requisition comes fatigue-duty. Appeal is made to the help, willing or compulsory, of the workers available in the locality, to dig rest trenches, to construct roads and railways, to remove and cremate the dead, to thresh and convey the corn. On the other hand, the military authorities give these workmen leave of absence for their own pressing duties, and occasionally lend teams of workers to the farmers. The people without arms naturally takes its place in the extended sphere of action proper to the people in arms.

Think of the long stretch of the battle-front ; think of the provinces involved simultaneously

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in an immense zone of devastation over twenty miles wide, and then of those occupied successively during an advance or a retreat: the iron heel of Necessity presses heavily on all these people.

It also oppresses—and that permanently—immense regions far from the front: those which have been invaded. Here too the civilian is forcibly precipitated into war, mobilized and incorporated, in spite of theorists on human rights, into a kind of semi-military *régime*. We find the Germans treating every one more or less as *francs-tireurs*. The most peaceful submission does not prevent the poor Belgian villagers from being interned, mutilated, exiled, and shot.

The civil population behind the German lines, according to the 'Eye-witness' who accompanied the British Staff, are reduced literally to a state of slavery. For the work they do they receive military rations, without which they would die of hunger. The men are compelled to serve in the German army. The houses are burnt to the ground. The women and children, either driven in front of the troops under the enemy's fire, or compelled to undertake toilsome labour for the benefit of the victors, or sent into captivity hundreds of miles away, are treated quite as harshly

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as if they had actually borne arms. No accusation is too bad to bring against them ; the upheaval of the moment does not permit of individual investigation being made.

By gradation of responsibility discipline would be more easily maintained ; to protect the people, it would be better to incorporate them into regiments. It is the regular corps, provided with a military status, that are best protected against the arbitrary power of an enemy.

## CHAPTER XI

### GENERAL MOBILIZATION

**B**ESIDES, it would appear that the effective forces of the combatants themselves would be increased by general mobilization. In the determined and whole-hearted effort of a nation which refuses to be crushed, the devotion shown by its inhabitants is greater than ever before. Many posts, formerly reserved for the combatants themselves, are now applied for—and might well be filled—by the feeble, by old men or children, or even by women.

Whereas the latter have become more masculine, as it were, military tasks, on the other hand, now frequently assume a less brutal aspect. Killing is not everything in war: our soldiers spend a great deal of their time in building and digging; some keep guard over the lines of communication; others drive motor-cars, convoy supplies, administer and take stock of stores, keep the books and prepare the meals. Women could be found capable of doing such work and anxious to

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devote themselves to it. They actually have been found. In a certain number of special buildings, such as the Crystal Palace, in London, women have been trained in various military tasks under the direction of army officers. They were said to be mainly suffragettes. They were then embarked for France, in companies of five hundred each. They have replaced signallers, telephonists, telegraphists, despatch-riders, paymasters, automobilists, stretcher-bearers, etc., right up to the battle-front. In no direction has the patriotism of the women been inferior to that of the men, and if any of the new modes of employment should expose them to danger, they would assuredly show that they too know how to die.

What they are least capable of doing is to kill. But even here exceptions have been found. And, along with women, there are many old men or youths upon whom war will some day call, for fighting demands less and less muscular expenditure; frequently all that is needed is clever hands, keen senses, and an alert intellect, all of which are compatible with youth. The most dreadful engines of destruction will some day be elegant machines, worked by light hand-levers or innocent-looking taps or valves; a child's finger will be able to control them. On our huge ironclads,



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a woman's strength is sufficient to point the biggest guns ; press a stud, and a whole turret is set in motion ; a turn of a small wheel, and the mighty ship alters its course.

Consequently, it is impossible to reflect on war in the distant future without picturing our descendants ready for a sacrifice even more complete than is our own at the present time, animated by boundless heroism and obedient to a strict and all-embracing discipline, each man in his place and at his allotted task.

Affected by rules and regulations, by public authority over his own property and person as well as over that of his family ; himself, his wife and children, and all his relatives in a state of constant subjection, like so many soldiers in the ranks, the civilized individual will temporarily have parted with his freedom as a man and a citizen. Willingly will he submit to a dictatorial absolutism superimposed on a kind of patriotic socialism. Like a suddenly solidified mass, the whole people will then be as one single block, facing that of the enemy.

To enrol non-combatants in different categories, to subject them to a stricter discipline than the mere police authority they now obey, to draft them into work within their

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capacity, but compulsory, to utilize them for those subsidiary tasks of which combatants might well be relieved: in all this there is nothing impossible. Mobilization of this kind would evidently mean that the great majority of those mobilized would remain in their homes and at their trades. All the same, it would bring into action an enormous amount of force now lost or ill-applied. It would spare the country that squandering of its active resources which so largely nullifies them. Nowadays, when questions of material have assumed preponderant importance, a system capable of developing, in a large measure, the production of supplies, provisions, munitions and guns, motor-cars, aircraft, etc., might suffice to ensure victory.

## CHAPTER XII

### THE DURATION OF WARS

**W**E will now leave this inner elaboration, still in embryo, which will in future characterize war conditions, and pass on to their outer manifestations: the war operations themselves. We had deemed it impossible that they should last for any length of time. We even predicted that the nations, exhausted by the tremendous effort of mobilization, would be unable to endure, for more than a few weeks, the stoppage of all industrial and commercial activity. Events have not confirmed these prognostications.

Why should a war be short? We will try to discover by what necessities it is limited. In times now long past, when agriculture was almost the sole occupation of man, wars might be prolonged indefinitely. Their necessary termination came about only by the extinction of one of the sides engaged, when all the combatants had either been killed or carried off into slavery. The military equipment, consisting of a few varieties of 'cold steel,' practically never wore

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out. The utensils and substances indispensable to an extremely simple existence were scarcely worth troubling about. A short break in the fighting sufficed for the ingathering of the crops : the women and children attended to all else.

In civilized life it is not so easy to tolerate war conditions. A large proportion of the complications of which civilization consists demand conditions which become difficult to realize. The innumerable daily enjoyments or conveniences, that have now become needs, are the result of a combination of many pacific activities. We are left in the lurch if a single link in the chain fails us : workmen called up, works given over to army purposes, or damaged, or diverted from their ordinary uses, etc.

Many things we can do without ; do without others we cannot. We may, as it were, revert to a previous state of civilization, when it is only a matter of depriving ourselves of a few personal comforts. But victory is based on the same foundation as comfort, and its requirements cannot be brought into a simpler form. For instance, we would readily sacrifice excursion trains ; but we must have trains for the transport of troops, and, consequently, everything implied by railway exploitation.

There will always be a tendency to carry expenditure on material to its extreme limits, in

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order to obtain results with the least possible expenditure of human life. We naturally endeavour to preserve the *personnel* at the cost of the material ; consequently the latter will often be the first to be exhausted.

It would thus seem that modern wars must be of limited duration, in a certain number of cases, owing to exhaustion of previously accumulated resources in one of the belligerent countries, in the form either of ready-made products, of raw material, of means of production, or lastly of money, and credit permitting of the purchase of what the country lacks.

Hence a common mistake has been made in estimating the three important factors that control the length of hostilities : a sufficiently high value has been put neither on the enormous consumption of material and money resulting from war ; nor, on the other hand, on the elasticity of our needs, and, above all, on the vastness of the resources of a great nation.

These resources, in the three forms which we have considered, increase very rapidly with the level of civilization. The capital accumulated, in every part of a civilized country, in the form of supplies, utensils, plant, and financial reserves, is far beyond what was imagined when the attempt was made to calculate the power of resistance of the nations. On the one hand,

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therefore, ordinary life is less disturbed after a year of warfare than even optimists would have deemed possible. On the other hand, people seem to become reconciled to privations much more marked than in the past, and which bring us almost to the same stage of destitution : for man, in spite of his new habits, has not so greatly changed his nature.

If economic factors alone are incapable of bringing the struggle to an end, we must fall back upon the essential factor : man himself. We must wait for the physical exhaustion of the one or the other belligerent.

Now, battles are not so deadly as in former times, either in regard to time or in proportion to the troops engaged. Both the duration of the fighting, however, and the numbers engaged have greatly increased. In the past, the conquered were slaughtered and exterminated ; a whole army was annihilated in a single day. In spite of their seeming so terrible, decisive battles probably claim fewer victims in proportion as weapons become more perfected. Our shells wound more frequently than they kill, and half the wounded return to the firing line. It is this that enables the struggle to continue, and the most dreadful battles to follow one another, to a degree far beyond what would once have seemed possible.

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Meanwhile, millions of men are facing one another ; every day fighting is going on somewhere. A complete battle, if the word has a definite meaning at all, lasts five or six weeks, or even longer. It has been calculated that the combined German and Austrian armies lose nearly ten thousand men daily. But the total mobilizable effectives also are incalculably greater than those of former wars.

If the struggle becomes protracted, however, we shall reach a stage at which the disproportion between the forces will leave one of the two sides no hope of further successful resistance. This is what was seen to happen in the great war which perhaps most nearly resembles the present struggle : the War of the American Secession.

Beginning in April 1861, it lasted until May 1865. After a year spent by both sides in organizing their armies, after another year in which the South, by reason of their martial spirit and military activity, triumphed in succession over the generals of the North, who lacked common effective action, after alternate and indecisive offensives, the decision was obtained, not by a victorious attack, but by a protracted wearing-out process, in which the North had the two essential advantages : numerical superiority of reserves and mastery of the sea. At the end their soldiers were more than three to one in

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number : two hundred and ninety-four thousand against eighty-one thousand in 1864.

Modern times show more long wars than short ones. Against the French Revolution, a coalition of nearly the whole of Europe fought in vain from 1793 to 1797. As yet this was a national war for the French only. The second coalition lasted from 1799 to 1801, the third took place in 1805, the fourth in 1806-7, the fifth in 1809. The Russian campaign and its consequences lasted from 1812 to 1814. Though sudden and crushing blows were dealt, these were not wars of a few weeks' duration.

The war for the independence of Greece, which was inaugurated by the general revolt of 1821, and made a European affair by the battle of Navarino in October 1827, was completed only in September 1829. In the Crimea, fighting went on from 1853 to 1856.

At the end of the nineteenth century wars became shorter, and though the Tonkin War lasted two years (1883-1885), and that of the Transvaal two years and a half (1899-1902), the war in Italy in 1859 took only two months and a half, that in Austria in 1866 two months and ten days, that for Cuba in 1898 between Spain and the United States seven months, and the Franco-German War in 1870 also seven months. The Russo-Turkish War, from April 1877 to March



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1878, lasted less than a year. Japan fought China from July 1894 to April 1895 only, but she fought Russia from February 1904 to August 1905, about a year and a half. On the other hand, the first Balkan war, begun in September 1912, really ended before 1913. No need to mention the second. The trend seemed to have set in toward shorter wars ; we now see how deceptive appearances were.

Of the three elements of success—numbers, material, and territory—it is the last that now seems easiest to retain, so long as the other two are not at too low an ebb. The present defensive power is the true reason for the long duration of the war. This makes it possible to retain to the end not only the territory of the nation but all its varied and recurring resources. Short wars are those in which the front, like a delicate balance, responds to the slightest inequality in the opposing forces, this inequality being indicated by a considerable falling back of the weaker side.

In the ever-recurring struggle between protection and projectile, after a series of oscillations, as a rule a state of balance is restored. We have no means of finding out whether one of them will finally prove victorious. Should this happen, then the aspects and progress of warfare would become fixed for all time : the

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complete triumph of the defensive would mean war never ending ; that of the offensive, war of lightning rapidity. The one corresponds to stable equilibrium and the other to unstable equilibrium, which each inclination hurries with increasing violence to its fall.

Thus we see that nothing justifies us in thinking that future wars will necessarily be shorter than those of past ages. Superficial quarrels will probably be decided by arbitration and a reasonable pacifism, without the shedding of blood, but there will remain deep-rooted differences, which no artifice could remove. These will result in bitter contests. The importance of the interests at stake, the ardour of the passions let loose, and the material might of the opposing hosts will cause gigantic struggles which will be carried on ruthlessly and to the bitter end.

## CHAPTER XIII

### COMPLICATIONS

**M**ILITARY forces spring from the very heart of the nation: it is this that makes them almost inexhaustible. No sooner are they discomfited or scattered than they spring up again from the soil, as it were. What is most amazing is not their perpetual motion; it is their rebirth, their continuance in being.

To consider only the numbers of the armed forces is to take but an imperfect view of the matter. These numbers must be multiplied by those of the needs for which provision has to be made. Each man uses in turn a certain number of weapons and tools, consumes so many kinds of projectiles, needs such a varied supply of stores that he gives employment to every trade. The army itself is a sort of Jack-of-all-trades. An image of the nation, the flower of whose manhood it has gathered together and which it tends completely to absorb, it lives innumerable lives at the same time.

In the army most of the peace-time activities

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find their analogies ; there are not only employments connected with the material world, such as those of the baker, butcher, herdsman, dog-breeder, cook, shoe-maker, tailor, wheelwright, blacksmith, mechanic, joiner, navvy, mason, electrician, chemist, telegraphist, photographer, etc., but also several of those which concern man very intimately and deal both with the body and the soul ; from the Society for Providing Soldiers with Foot-baths, the humble trade of the chiropodist, the tonsorial and dental arts, on to the ministry of the army chaplains, including the postal and medical services, journalism, the teaching profession, and the law.

The army absorbs so great a number of men from all parts, it keeps them so long and sets them to perform so many tasks, that it is bound to summarize in itself, with increasing completeness, the entire life of the country. Indeed, it tends to split up into an ever-increasing number of special departments and industries. But in the army there is a unity in this diversity. This subdivision is due to several enduring causes which certainly have not yet produced their full effect. The large number of men involved allows, nay, calls for, subdivision of labour. For supplies especially there are the same reasons for subdivision as in other productive industries,

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namely, economy and speed. Material progress, which makes for comfort and introduces it even in the trenches, is also a cause of certain complications. Most of these, however, are due to the new weapons of destruction.

[— Whenever some new mode of killing makes its appearance, simple-minded people expect that war itself will be rendered impossible from excess of destruction ; while, on the other hand, technicians announce that at an early date all the old weapons will be scrapped. But rifles are added to sabres and lances, bombs to bullets, machine-guns to bayonets, aircraft to armoured trains, and submarines to ironclads, without man abandoning any of the instruments of death which one after another science puts into his hands.

It is a wonder that bows and arrows have gone out of use. Slings, catapults, and Greek fire have lately reappeared, but in more terrible forms than of yore. We have no fewer than five substitutes for cavalry, if we include under this head not only cyclists, but also armoured cars, captive balloons, dirigibles, and reconnoitring aeroplanes. On land, artillery of every size is in use, from the machine-gun and the bomb-thrower, the 75 mm. gun, and the 420 mm. mortar, to the 520 mm. cannon, in all from twelve to fifteen calibres on each side.

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The various types of vessels range from the motor launch, with two sailors, and the steam trawler, with a crew of five or six, to the super-Dreadnought, manned by over a thousand. To telegraphy and telephony has been added the new wireless variety.

The various special activities are distinguished by various badges, and in France chiefly by armlets, of which there are about sixty main varieties: the full list would fill quite a small dictionary.

Thus we see that, in addition to the men themselves, an army represents an immense number of objects of every kind. Each complete unit forms a microcosm. A few individuals—machine-gunners, or a gun team—constitute a centre toward which converge endless streams of munitions, of commands and of human effort, of which the men themselves form but an insignificant part. There is as great a difference between a hundred thousand soldiers of the First Empire and the same number now in the field as between the stage-coach and the express train: no comparison can be drawn between them.

Nevertheless, the effectives have increased beyond all expectation. In the last of the great wars, that in Manchuria, the opposing armies at the commencement of hostilities

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numbered about one hundred and fifty thousand men each, and at the end about three hundred and fifty thousand. In 1870, our own army on the Rhine must have numbered two hundred and fifty thousand men against three hundred and ninety thousand Germans. Four years previously, the battle of Sadowa was won by three hundred thousand Germans over two hundred and fifty thousand Austrians. During the Revolution, and under the old Monarchic System, battles were fought with armies numbering from fifty thousand to one hundred thousand men.

And yet Napoleon, in advance of his time, had already endeavoured to carry numbers to their extreme limits. The *Grande Armée* was his conception. Whereas, as a rule, his fighting forces numbered from one hundred thousand to two hundred thousand men, he is said to have brought together over a million men in 1812. (As a matter of fact, he used no more than six hundred and fifty thousand. Even this number was greater than a single commander could handle. He thus arrived at the modern conception of army groups. In spite of his genius, however, he never succeeded in co-ordinating such huge formations: the machine was too heavy for the means of control available at the time. He

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had pushed ahead of the material conditions of his age.

During the past century great strides forward have been taken. Army groups easily act in concert, remain compact and work simultaneously, thanks to telegraph and telephone, railways, motor-cars, and balloons. It is rather the command which does not come up to modern possibilities; it had never considered as an eventuality the putting of over two million men in the field at the same time.

The French expected to have against them only twenty or twenty-one German corps on active service, with three or four reserve corps, whereas thirty-three corps and nine cavalry divisions faced them from the middle of August 1914. Later on, they were opposed by more than fifty. According to the Russian statistics for June 1915, the Germanic armies on the Eastern front included forty-five German and twenty-six Austrian corps. The effective forces of each army on the Western front have been estimated at two and a half millions, and those of each army on the Russian front at nearly three millions.

These enormous totals are split up into armies of from two hundred thousand to two hundred and fifty thousand men. Each side has, at least, ten of these armies on the same



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front, arranged in groups of two, three, or four armies each. The famous Mackensen phalanx, which won Galicia back from Russia, was composed of ten symmetrically arranged army corps: two in the front line followed by the artillery spread over three lines—light artillery, field howitzers, and heavy artillery; then six army corps in three lines, two by two, covered by flank-guards; and finally, two reserve corps. A total of more than four hundred thousand men on a front of twenty kilometres: twenty men to each yard!

Before any other material progress is effected, even greater efforts at co-ordination might be made. We can imagine the effect of synchronous allied operations over a country like Germany. Though it has remained somewhat indeterminate in the present war, this simultaneousness might become quite definite and precise. No doubt men will make scientific use of the results of our experience to obtain effects vastly more powerful than those which our leaders have attempted until now.

We are only at the beginning of mass movements. The results are not to be gauged simply by the numbers simultaneously engaged in the same strategical combination, but also by the importance and extent of other con-

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centrated efforts : that of material more particularly. The French May offensive in the region of Notre-Dame-de-Lorette is said to have required eleven hundred cannon, that of the Mackensen phalanx on the Dunajec, fifteen hundred. The Germans would appear to have brought up four thousand against the Russians, on a front of thirty miles. At Verdun they had at least double this number.

To cannon must be added other war equipment : machine-guns, aeroplanes, motor-cars, lorries, etc. ; material for protection purposes : gas helmets, shields and steel helmets, trench tools, barbed wire, cement ; consumable material : munitions, explosives, and food.

It is here that it is difficult to provide adequate supplies, especially in the matter of projectiles, the consumption of which will assuredly expand enormously. The supply of shells is still far below the demand. The French had reckoned on an average expenditure of thirteen thousand shells daily. Our enemies, more far-sighted than we were, calculated on thirty-five thousand. As a matter of fact, in certain battles considerably over one hundred thousand were used. Germany is said to have manufactured two hundred and fifty thousand daily.

Yet gunners have practised a rigid economy.

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A 'seventy-five' gun is capable of firing twenty-five shots a minute. Admitting a relatively moderate speed, and the fact that a gun is used only for a few minutes each hour, we nevertheless reach a figure of between one hundred and two hundred shots an hour for each gun during a battle.

It is probable that in the future, war works will be called upon to supply daily, and convoys to distribute along the whole of the front, millions of artillery projectiles, perhaps even billions of rifle and machine-gun cartridges.

## CHAPTER XIV

### CONCENTRATION AND CORDON ARRANGEMENTS

**B**ECAUSE of the impossibility of bringing together, at the same time, on the few kilometres where a decisive battle is being fought, all the means needed to produce the desired result, whether they be troops, material, or supplies, increasingly greater use will have to be made of the ultimate form of concentrated effort: condensation in point of time.

First, we will take note of a new characteristic which stands in contrast with the poor results obtained by offensive tactics and with the prolongation of hostilities: the extreme mobility of army operations. In spite of the enormous bodies of men engaged, movement is rapid and change incessant. The campaign seems to be one perpetual recommencement. In former times a renewal of the offensive was slower and more difficult; but now, methods of mechanical transport enable great bodies of men and munitions to be mobilized and concentrated, within

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a few days or weeks, in an altogether new theatre of action. Reinforcements amounting to millions are brought from the interior ; an unsuccessful action in one direction is relieved by an offensive in another ; the enemy's strength is successively tested along his whole front, and when his attention has been diverted, a fresh attempt is made : we are reminded of the quick feints and parries of a fencing match. - millions die

All the same, the accumulation of heavy material necessary to destroy trenches by shell fire, the preparatory labour which this involves, above ground and below, prevent any immediate shifting of the central spot at which some great effort is to be made. A month or two at least is needed in preparing an attack against a well-organized front.)

One thing only seems incapable of extension : the ground. Between frontiers or oceans, a front is a restricted area. Consequently, the density of the fighting forces per unit of length is destined to increase with the total army force, and to exceed what the surface of the soil can advantageously support. Moreover, there is undoubted advantage in condensing the main assault within the narrowest limits. If there cannot be simultaneity, there must be repeated attacks.

Modern methods of transport render possible

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these quickly repeated concentrations : this is the wave-attack system. One troop in full action is immediately followed, supported, and replaced by another, which until then had remained under shelter. There must be perfect regulation of movement, either by clock time or by word of command. In this direction both experience and equipment still leave much to be desired.

It has been said of the present struggle that it is an artillery war ; the indispensable and glorious part played by foot-soldiers, both in holding trenches after a frightful downpour of heavy shells, and in storming the enemy's trenches amid a hail of machine-gun projectiles and hand-grenades, has made it an infantry war to quite as great a degree. Nor must one under-estimate the essential importance of the defensive work performed by the engineers ; or relegate to the background the decisive influence of the A.S.C. work or that of the air fleet. In reality, this is an all-round war in which every part is equally essential ; and the co-ordinating action of the High Command assumes increasing importance in proportion as the means become more complex and the methods more precise.

Concentration in time leads to accumulations of troops and material in depth. Used on a large scale, this will prove to be the corrective of

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the cordon arrangement which characterizes the present war. It will assume its full importance when the aeroplane, having become the means of transport it ought to be, enables extremely rapid movements to be effected and fighting bodies to be superimposed in every layer of the atmosphere.

The defensive and quasi-uniform cordon was characteristic of the war of 1914. Already in 1915 denser nuclei began to appear. What was the origin of the new and doubtless transitory fortune of a method utterly condemned by experts? It must be due in part to the lack of due proportion already mentioned. The cordon is the method employed by strategists who have too numerous a fighting mass to deploy in an organization that is too weak in command, in communications, and in transport. Hitherto we have not learnt to make sufficient use of concentrating agencies.

[For the first time a number of armed men has been raised, sufficient to line an entire frontier: a conjunction of numbers with the power of the defensive. An adequate supply of tools and men for digging, and, if necessary, for concreting trenches, tunnels, and caves; barbed wire, extra-rapid firearms sweeping the glaxis of these field fortifications; the artillery itself secreted in the rear: these are the main

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elements of the new defensive superiority. The cordon now became a possibility. The thin line, which would have been broken forty years ago, now held fast. We yielded to the temptation to take cover behind it.

We yielded all the more readily because of the great importance of the services in the rear. With so great an expenditure of supplies, it is less than ever possible to allow one's communications to be endangered. Now, these depend mainly on a fixed network of lines : the railway system. It becomes essential to guard one's ground, and the latter, owing to the increased mobility of forces, is now more threatened by outflanking movements than was formerly the case. And so we have mobility and comparative weakness of attack, power of defensive, huge numbers of effectives, inadequate organization, all of which contributed to the drawing out of armies in thin lines along the fronts, like their flags pinned on our maps.

Perhaps, in future wars, there will have to be an uninterrupted defensive zone along the frontiers. It will probably be no more than the surface of a deep-formation arrangement, plentifully supplied with defensive and offensive centres. A modern country is like a living being which cannot survive certain wounds that have penetrated too deeply : it must have a



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carapace. It is by means of organs of attack, however, that it fights. Its triumph involves a projection of life outward.

Is not this the most complete of all vital manifestations? It necessitates the closest combination of the three orders of force: preparation, matter, and soul. In this, as in other things, though the evolution of modern conditions will not let us escape from our times, this evolution releases us from a material and animal fatality. It is not likely that we shall be crushed beneath the awful powers which we compel nature to yield up to us. While they dwarf our physical might, and seem to obliterate the material factor in us, they proportionately increase the strictly human factors, for they belong to a different order of things and afford no ground of comparison. They bear them on their surface, as a wave carries a cork on its crest.

All these changes have striking counter-effects. While the violence of explosives and the hail of bullets which machine-guns can deliver have done away with those open displays which gave such a gala appearance to the battles of the Middle Ages, these have been replaced by the cunning ruses of savages in ambush. Our men glide along the ground like Redskins; they have learnt to practise concealment almost as well.

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Strange to say, the long range of firearms has led to the propinquity of trench warfare, to hand-to-hand fighting in bayonet assaults. The extension of machinery culminates in a need for and an outburst of individual courage probably unequalled in military history. It calls not only for the highest degree of valour, but also for incessant mental activity. The machine makes war less mechanical ; it spiritualizes war.

Thus we see that the value of an army remains to-day what it has always been : the product of two equally indispensable factors. It is, as mathematicians would say, a function with two variables : man and matter, or, in other words, soul and mechanism.

Here the value of courage is not reduced to zero, rather is it increased by the power of the agencies this very courage employs, just as war machines are useful in proportion to the worth of the men controlling them. Each factor serves the other as a coefficient, a multiplier. If one of them falls to zero, the product is also zero. Lacking such a soul as ours, our enemies derive from the most perfect armament nothing more than scientific barbarity, and, let us hope, final collapse ; lacking arms equal to theirs, our own chivalrous heroism would never give us anything but a superiority alike precarious and barren of results.

## CHAPTER XV

### RAILWAYS

**I**T is now quite clear that future wars—since fighting will still be possible for years to come, whatever be said—will be very different from those of the past. What we see at present warrants the conclusion that they will effect a profound transformation in the life of the nations. The social aspect of war is something quite new; its material aspect will be no less so.

We cannot attempt to inquire into the whole machinery of modern warfare, but will confine ourselves to a brief consideration of its salient traits. Means of transport have assumed a supremely important place. The first of these is the railway. A single train is capable of carrying an infantry battalion or a battery of field artillery. Horses and material are cumbersome things; to transport an army corps—thirty thousand combatants—fifty or a hundred trains are required, according as the fighting units only are taken or the entire convoy of departments in the rear accompanies them.

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The entraining takes some hours—from two to three on an average. This, however, depends largely on the material to be loaded and the advantages offered by the station, such as platforms and various other contrivances. The same length of time is required for unloading. Military trains move at regulation speeds which do not vary: from twenty to twenty-eight miles an hour. They follow one another at regular intervals: a single track allows of the passage of a score of trains in each direction every twenty-four hours; a double track allows of fifty, sixty, one hundred, or even more, according to the sidings and the good working of the block system. On some days and over certain lines the total has reached two hundred and twenty.

Thus we see that a double line might carry, on an average, an entire army corps per day. But there are many things to take into consideration, especially junction-lines, and it is manifestly of the highest importance to have large numbers of parallel tracks. In this respect the French 'Nord' system and the German frontier systems offer facilities which cannot be found on the Russian railways, for instance.

See how the Germans have developed their system of strategic lines in Alsace-Lorraine of

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recent years. New tracks between Metz and Château-Salins, between Saarbrücken and Dieuze, between Strassburg and Vendenheim, between Metz and Sarrelouis, *via* Bouzonville, between Freiburg and Schlestadt, between Huningen and Ferrette, between Mülhausen and Wesserling, etc. ; immense stations, such as Strassburg sorting station, covering two hundred and twenty acres, with innumerable platforms : all this shows how the German army depends on its frontier system.

In 1913 the whole of the French systems represented fifty-one thousand one hundred and eighty-eight kilometres of lines ; in Germany there were sixty-three thousand seven hundred and thirty, and in Belgium eight thousand eight hundred and fourteen. The six great French companies, including the State railways, own about fifteen thousand locomotives, thirty thousand passenger carriages, four hundred thousand goods waggons and trucks. The German Government, which had been preparing for war in every possible way, possessed, in addition to its working stock in peace-time, accumulated reserves solely destined for war service.

The following is a list of the railway tracks, and their lengths in kilometres, in other European countries, compiled by the

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*Financial Messenger* of Russia, for the year 1913: England, thirty-seven thousand seven hundred and seventeen; Austria, forty-six thousand one hundred and ninety-eight; Russia in Europe, sixty-two thousand one hundred and ninety-eight; Italy, seventeen thousand six hundred and thirty-four; Luxembourg, five hundred and twenty-five; Holland, three thousand two hundred and fifty-six; Switzerland, four thousand eight hundred and sixty-three; Serbia, one thousand and twenty-one; Rumania, three thousand seven hundred and sixty-three; Greece, one thousand six hundred and nine; Bulgaria, one thousand nine hundred and thirty-one; Turkey in Europe, one thousand nine hundred and ninety-four.

At first, the entire mobilization and concentration was effected by means of the railways. In France, we required four thousand seven hundred and fifty trains. Everything was carried through with the utmost order. The army still has a permanent need of railways for two purposes: its communications with the rear and its movements from place to place. The former are fairly regular, the latter essentially irregular; but since sudden necessities must be met without delay, a considerable stock of material is kept always ready, and thus immobilized.

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For the supply of one army corps alone it was calculated, before war broke out, that train loads aggregating one hundred and twenty tons per day would be needed ; experience has shown that as the stationary condition of the fronts causes the immediate exhaustion of all local resources, this figure must be raised to two hundred tons.

The rush for the sea-coast which preceded the battle of the Yser is present to the minds of all ; great concentration efforts were occasioned by such fights as those in Champagne and in Artois. When the French began their offensive in Lorraine and Belgium, and subsequently withdrew to the south of the Marne, more than six thousand military trains were utilized. Armies are in a state of continual migration, although the French forces have remained far more stationary than those of Hindenburg, for instance, when they were continually going backward and forward along the Polish front and that of Eastern Prussia.

It was Napoleon who said : " The strength of an army, like momentum in mechanics, is the product of the mass and the velocity." Now, the railway is a means of communicating great velocity to great masses. In a single day a train can travel a distance of six hundred kilometres ; on foot, we cannot go more than thirty.

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Railway development is one of the most striking features of civilization. In this direction, as in several others, the outskirts of our large towns give us an idea of what will some day happen to these old countries of ours. We have seen the statistics of the total length of the lines in each one ; if we take the figures dealing with their development in proportion to area and population, we find that they vary, for a hundred square kilometres, from 1 to 2 kilometres for Turkey, and from about 2 for the Balkan countries up to 12 kilometres in Great Britain, 20.2 in Luxembourg, 30 in Belgium ; and per ten thousand inhabitants in the same Balkan districts from 3 or 4 kilometres up to 13 in France, 21.3 in Luxembourg, and 26.5 in Sweden.

It is obvious that yet more railways will be built. We may consequently expect that the mobility of armies will increase, on this count, far more than their effectives. Countries organized for war will be certain to set up a close network of lines on their frontiers, long before the local traffic makes them necessary.

To do the thing thoroughly, they will establish belts of parallel tracks sufficiently numerous to convey, in a single journey, the whole of the general reserves. By this we mean the forces available for action at any



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given point, once the trenches are lined all along the frontier. The number of parallel lines to be duplicated in this way will depend on the effectives, on the number and carrying capacity of the trains, on the facilities for unloading, etc.

The extension of war conditions to a number of countries will often bring about a state of things similar to that now existing in Austro-Germany, which is either attacked or attacking on two opposite frontiers. In this case, the lines that cross the country from one frontier to the other perform a military *rôle* of the same order as the frontier roads. They are used for proceeding backward and forward, not from one point to another of the same front, but from one front to the other ; and these great streams of troops further complicate the use to which the railways are put for purposes of supply. Consequently, in war-time, no railway is useless. We see a proof of this assertion in the fact that the Russians carry munitions on the Kola and the Trans-Siberian railways.

Enemy-surrounded countries have the advantage of interior lines, which enable them to transfer in succession almost the whole of their forces against each of the army groups threatening them. This was the great art of Napoleon. Railways facilitate these changes of position.

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Frequently, too, they supply means of warding off attacks, since they offer considerable opportunities for movements along exterior lines. For instance, it is possible to make the circuit of such a country as Poland in a very few days, and so to counterbalance the efforts of hostile reinforcements which have crossed it as the crow flies.

The gain in time obtained by using interior lines is only the excess of the one journey over the other. This gain in time manifestly decreases as transport becomes more rapid. But to obtain the same results as in the past, it would need to be greater, because battles last longer nowadays. An army was formerly put out of action in a few days : it had no time to obtain assistance ; to-day weeks are required.

In this respect, the march of progress restricts the advantages of interior lines as well as the importance of most strategic artifices, and probably also the predominant *rôle* played by the great military leaders. It makes more certain the consequences of an all-round superiority of moral and material forces. Victory is more the reward of a people, less the success of one man.

The preparation of railways for war uses is not confined to the planning of the system itself. It extends to the provision and adaptation of

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stations, to the duplication of the lines, to the defence of bridges and other structures, to the provision of rolling-stock. Considerable extension may be looked for in all these directions. However important the motor-car and the aeroplane may be in military transport, it is probable that the railway will always be the most satisfactory means of conveying heavy material.

The railway carriage itself can be adapted for military uses. We have tank cars, cold-storage cars, hospital trains ; above all, we have armoured trains and truck gun-carriages.

We can conceive of the employment of large numbers of these bullet-proof armoured trains, carrying machine guns and light cannon. The drawback to their use is that incidental to everything connected with railways : the narrow and limited field of action, and the many risks of being brought to a standstill. On the other hand, train-armouring cannot be carried very far ; trains would become too heavy, and even so would be useless within the range of shell-fire, since the latter can stop them by damaging the lines.

Railways will perhaps render more effective service than ever in the matter of bringing to the required spot huge guns too heavy to be transported in any other way. These will be fired without leaving the rails. The name of

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truck gun-carriage is given to the special cradle which bears the gun; it is so arranged as to withstand the recoil; this result is obtained by placing on the ground, once the carriage is stationary, supports which take the load off the wheels. The recoil is transferred to the ground, so that the rails do not suffer. We have truck gun-carriages for almost every type of heavy artillery, from the 155 mm. up to a bore of 370 mm., and even beyond. Large siege guns are, as a rule, fixed to concrete platforms, but the railway is indispensable for conveying them to the platforms.

The reader may ask what is the highest calibre capable of being carried by rail on a special chassis. Ordinary rolling-stock takes a maximum load of ten tons, *i.e.* five tons per axle. By distributing the weight, however, over a sufficiently large number of axles, it is possible to transport, by rail, cannon weighing about one hundred tons, *i.e.* of a calibre of 40 cm. to 50 cm., according to the length of the gun and the weight of the accessory machinery. The German mortar of 42 cm. calibre was evidently made of that particular size to meet these conditions.

Whether the object is to organize a supply line, to transfer reinforcements, or to carry heavy material to its destination, it may be of

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service to provide for the absence of normal lines by laying down rails along the road. Both the Germans and ourselves have done this very frequently. A narrow gauge, of sixty centimetres, is generally used. A team of skilled sappers takes about three hours to lay down about one kilometre of railway.

The provisioning of our troops during the battle of Verdun was partially effected on a narrow-gauge (1 metre) track, the Meuse railway, which daily conveyed a load of two thousand tons.

All great armies have in reserve stocks of rails, along with their sleepers. It may be possible to carry preparations further by permanently fitting up along the roads themselves whatever would not interfere with their normal use, and more particularly by laying tracks on the footpath on one side of the road, and simply overlaying them with a foot-board. This system might be applied even to broad-gauge lines. Stores of material might be kept at various distances along the line, and the necessary sidings be provided. A great number of auxiliary lines thus fitted out in the rear of an army would prove extremely useful. Probably, in future European wars, the High Command will have at its disposal a huge mileage of railway tracks.

## CHAPTER XVI

### THE MOTOR-CAR

**T**HE most serviceable means of transport, however, is the motor-car. The slightest accident may block a railway, but the motor-car can be brought to a standstill only by destruction of the road—a rare event—or by the stoppage of its own motor. Motor-cars played a decisive part in the battle of Verdun, where the French defensive positions, half-encircled by the German front, had their railway communications under the fire of the enemy's big guns.

The same will happen again. Heavy long-distance bombardment, characteristic of the new style of fighting, interrupts the railways far behind the front. It also damages the roads, as the motor traffic does itself. They are kept in repair, however, by a host of army road-menders, who are constantly breaking stones, raking, watering, rolling, putting up sign-posts ; the rear of the army is a scene of constant activity.

Motor-cars of every kind have been requisitioned

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tioned for war purposes. Private cars, from the luxurious limousine down to the simple motor-cycle, are reserved for staff officers, despatch-riders, couriers, etc. The troops and material are carried by motor-buses, lorries, and tractors. Each large car will hold thirty men, and a convoy of a thousand or twelve hundred can transport an army corps. The taxi-cabs from the Paris streets were employed to hurl upon the flank of von Kluck's army a portion of the troops who fought in the battle of the Ourcq.

The convoys may attain a speed of twelve or fifteen kilometres an hour. A road will afford room for fifty or sixty motor-buses per kilometre, *i.e.* for fifteen or eighteen hundred men, thus supplying about twenty thousand men per hour. An army corps will extend over about twenty kilometres of road. On foot, a division occupies fifteen kilometres, an army corps thirty-two, and it takes eight or nine hours to file past. If we remember that the hourly supply of a railway is no more than five or six thousand men, we may judge the importance of motor transport.

France is pre-eminently a road country, and lends itself better than any other country to the intensive use of road conveyance. Where the High Command disposes of two or three

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railways to connect two places on the front, it is rare that there would not be at least a dozen roads available.

But we must anticipate a vast increase in cross-country transport. To-day this is only occasionally possible, but this mode of transport would no doubt become practical and normal if certain preliminary arrangements were made ; it is one of the problems for the near future to solve.

The arrangements to be made relate both to the cars and to the ground. Certain touring cars are able to pass over ploughed land, if not in any weather, at any rate when conditions are favourable. There remains to organize a service of very light cars, with special wheels, constructed for carrying at least five or six men. Shall we not some day succeed in supplying them with supporting planes, intended to lessen the pressure of the wheels on the ground ? We have an instance of this in running birds. Adhesion to the ground is not the only difficulty to be overcome : there is also its uneven surface. To what extent would the above-mentioned contrivance enable these difficulties to be met ?

An ingenious machine, which may attain the object in view, has been thought out, a circular rolling path which envelops the car in



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the vertical plane of its course. It sets itself on the ground in front of the wheels and rises up behind them. It consists of one rolling process within another slower one.

And may we not also avail ourselves of mechanisms that imitate the mode of progression of an animal? Or will the time come when we shall supply the leading cars of convoys with bridge-boards to be placed over ditches, streams, and quagmires? The accomplished fact is the only answer to these questions, though their solution would appear to be within the scope of modern science.

The Austrian army is said to have adopted an amphibious motor-car model, of the Zeiner system, which, in addition to running on wheels, is also screw-propelled. Its body, higher than usual, forms a boat. It is capable of crossing rivers, mounting the banks, and continuing without a halt. If only the problem is clearly put, there can be no doubt but that future motor-car makers will find its solution.

Again, we may organize beforehand tracks across the land, without interfering with such ground in peace-time. For instance, land-owners may be compelled to ensure through communication from public road to public road by means of their private ones, and to see to it that the tracks are clear of walls,

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ditches, long and thick-set hedges, and other obstacles.

If an open-field motor-car could be invented, columns could move forward on a wide front, and at considerably greater speed ; the supply of men and material per hour would be increased tenfold, perhaps a hundredfold. An army would go through its evolutions over a whole province almost as freely as a battalion on a drill-ground.

In a speech delivered in the *Chambre des Députés*, M. Maurice Binder stated that our automobile parks in the army zone regularly transported every month from one hundred and sixty to one hundred and eighty thousand tons of material, and about three hundred thousand men. Von Kluck's army, in its break-neck outflanking march upon Paris, and portions of Hindenburg's armies in Poland, proceeded as follows : one-third of the infantry—seventy-five thousand men, it is said, in the case of von Kluck's army—were conveyed in motor-cars, while the other two-thirds went on foot, until the cars returned for them. The ride in the cars took the place of a rest. In this way they covered over thirty miles a day. Five thousand cars were used. It is said that the German staff had assembled over twenty thousand cars on a single front for this purpose alone.

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At the beginning of hostilities the belligerent Powers could dispose of over two hundred thousand heavy cars. France had ninety thousand, Germany seventy thousand, England fifty-five thousand, Austria twenty-five thousand, and Russia ten thousand. Owing to the measures taken for encouraging the construction of heavy cars and tractors, France occupied a leading position. The vehicles subsidized by the State were specified to carry a load of between two and three tons at a speed of fifteen kilometres per hour. In Germany, a carrying capacity of four tons was required in the case of traction cars and two tons in the case of the car behind ; the speed was sixteen kilometres. The fifteen hundred Paris motor-buses were of inestimable service. On the very day following mobilization five hundred of them hurried away in the direction of the Belgian frontier. Berlin was able to mobilize no more than a thousand. The first British expeditionary army landed with seven hundred.

The rear transport material, dealing not with reinforcements, but with the wounded and with supplies, uses an ever-increasing number of cars. The French motor-buses have been used mainly for carrying meat. To each infantry regiment are attached thirty-nine horse-drawn or motor vehicles ; each ' seventy-five ' battery

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—four guns—has twenty-two; besides this, each munition section has twenty-eight munition waggons for the infantry and twenty-three for the artillery. An army corps also makes use of the four sections of the administrative convoy, each with one hundred and sixty cars, etc. . . .

Like the railway carriage, the motor-car has been adapted to special purposes. There are motor ambulances, motor kitchens, motor search-lights, motor telegraphs, motor ammunition-waggons, motor cannons, motor machine-guns, the aviation motor service, etc. During the winter of 1915 it was announced that the British army had received two hundred and fifty armoured side-cars, carrying machine-guns. These are light models. The Russians make them of a weight not exceeding two tons, all in, whereas those which the Germans used against them weighed as much as ten tons. They stuck fast in the muddy roads of Poland.

The weight must be proportionate to the size of the wheels. If the chassis were supplied with rollers like those used in road-levelling, it would be possible to convey very heavy loads by road, but only slowly. The maximum calibre of field artillery might thus be increased in the immediate future. The same result would be obtained by means of specially constructed

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railways, such as are used even now in fortresses, and as will probably be built elsewhere before long for strategic purposes.

We may also be tempted to increase the loads of our simplest armoured cars, either in order to protect them by thicker plating or to increase their armament. Yet the future would appear to be on the side of the light cars ; weight checks speed and compels us to keep to good roads. On the other hand, no car can be so armoured as to resist artillery fire ; a direct hit from a three-inch shell is fatal.

Rather must we expect to find the number of cars increase. This will constitute the true cavalry of the future, or, better still, the close union of the three arms. Could not a host of guns and machine-guns dashing across the plains, with soldiers mounted behind, charge the very trenches, and, breaking the enemy's front, spread over his territory ? Operating in huge masses at a time, their effect would be overwhelming.

We may recall how German motor artillery roamed over French territory in isolated units, proceeding along the roads at a venture, and how armoured cars, bearing one or two machine-guns and acting as patrols, advanced under cover of night far behind the lines, terrorizing the whole country, and carrying off the sentries.

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Thus scattered about, and linked to their own headquarters by wireless telephony, exploring motor-cars will cover a whole region in a few hours. Their direct contact will supplement the information obtained by aeroplanes.

## CHAPTER XVII

### THE AEROPLANE

**A**EROPLANES, indeed, in the present war, will be found to have played as important a part as motor-cars, but they will have a far greater part to play in the future. In the aeroplane, the means of transport and the fighting weapon are closely linked together ; they are of equal importance. It is likely that the aeroplane will always be incapable of carrying heavy material ; it will only be entrusted with the conveyance of the troops themselves. When it is used to move an army, it will have to find at its destination the necessary fighting material, brought there by other means.

At first, aviation was but an auxiliary process mainly intended to supplement cavalry exploration. Its function was to see. The Germans, better organized than ourselves in this direction, did not regard the aeroplane as a fighting weapon. Scarcely anything but speed was expected of it. For this reason the monoplane seemed to be the most satisfactory type. This was the minimum form of aeroplane.

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The French, however, soon became ambitious of obtaining closer participation of their aviators in the actual fighting. The most satisfactory results were speedily forthcoming. Not only was the battle of the Marne the sequel of a successful air exploration, which revealed the gap between two hostile armies, but the French aviators succeeded in destroying, on the 8th of September, half the artillery of the Sixteenth German Corps.

Military centres soon began to suffer bombardment, especially railway stations and batteries. For instance, on the 16th of June, 1915, German batteries at Givenchy and in the neighbourhood received three hundred and forty-two shells and a thousand small arrows. The observation balloons, the *Drachen*, were attacked and destroyed. Finally, aeroplanes attacked one another, and our heroes victoriously hunted down their opponents, who, for a long time at first, took to flight.

Every day there take place at least a dozen chases of this kind, the frequent result of an even greater number of observation flights. Certain bulletins speak of more than twenty fights on the front; that of the 19th March, 1916, mentions thirty-two. Moreover, our small squadrons have carried their shells behind the enemy's lines, a distance of more than two hundred



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kilometres, to Karlsruhe in 1915, and even to Sofia in 1916, a distance of three hundred kilometres. The aeroplane is being used more and more every day ; real air fights are becoming more frequent. During March 1916 we brought to the ground thirty-six German aeroplanes ; in May we brought down forty-one and the British seventeen.

As might have been expected, experience has shown that different types of aircraft must be used for the different tasks attempted. For observing, and especially for fighting, the pilot must take another man with him. Certain clever flyers, all the same, like Garros and Pégoud, have combined the duties of pilot and machine-gunner ; they steer with their knees and fire at the same time. Garros thought out the arrangement which allows of firing through the field of revolution of the propeller. It is thus possible to keep the propeller forward, the tractor type possessing several advantages. As a rule, however, the machine-gunner is a passenger ; sometimes there are even two in three-seater aeroplanes.

The most vulnerable part of an aeroplane is the motor. To avoid accidents, the latter has been made stronger and heavier. Hence we have the fixed motor, in place of the rotatory motor. To protect it from bullet shots, it is

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now armoured. To ensure continued progress when the motor is damaged, a spare motor has been fitted, and a duplicate control has been added, the observer being thus enabled to act as pilot in case of need.

All this implies increases of weight, which can only be realized with the biplane. We must also take into consideration the ever-increasing stores of petrol necessary for remaining longer in the air, supplies of projectiles, the various accessories used in signalling, taking photographs, etc., the searchlight in the case of night excursions : all sorts of novel arrangements.

Air-duel armament has made its appearance ; it has been considerably improved and is now in an advanced state of completion. We use armed aeroplanes, supplied with a revolver-gun of 37 mm. calibre : a redoubtable weapon for attacking Zeppelins. Air artillery has made a beginning.

The German chasing machine, a monoplane, rises to a height of a thousand yards in eight minutes. It attains a speed of seventy-five to ninety miles an hour. Covering a total distance of four hundred and fifty miles without renewing its supply of petrol, and remaining six hours in the air, it carries a load of over six hundred pounds. This is only one aspect of air warfare.

The Germans also use twin-motor biplanes

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which, by a change of arrangement easily effected before rising from the ground and involving a variation in the angle of incidence of the planes, are said to allow of the choice between considerable ascending power at a reduced speed—two thousand yards in twelve minutes, and seventy miles an hour—or considerable speed with reduced ascending power—over eighty miles an hour, though thirty minutes would be required to rise to a height of two thousand yards.

A similar transformation, even more pronounced, may perhaps some day be effected in the air itself. Certain effects relating to the movement of the machine will be brought about instantaneously, at the will of the aviator, just as bicycles can be supplied with a multi-speed gear.

The French also are in possession of an improved war weapon, for instance, the X—machine, though they expect to have before long something better still.

As aircraft construction progresses, the available extra weight is used for installing additional motors, increasing the safety factor and the number of bombs carried. Meanwhile our Russian allies have already made trial of a giant aeroplane invented by Sikorski, and supplied with a cabin capable of holding a number of

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passengers. The first model, to carry twelve persons, dates back to 1913. Since the outbreak of war there has, it is said, been constructed a larger one with four motors, capable of remaining in the air for twelve hours with five passengers.

Though giant machines are only in the experimental stage and suffer from serious disabilities, among others the difficulty in landing, this state of things may change any day. They alone will realize certain contradictory necessities in the matter of weight.

By reason of their inadequate carrying capacity, the direct action of aeroplanes against the ground below has not hitherto been of a very formidable character. So far they have mainly been used as auxiliaries to land and artillery forces. They have rendered the most signal service by supplying information, all that was needed being the ability to fly above the enemy's lines. They keep watch on hostile concentrations, locate trenches, describe the state of the fortifications, and, by watching where shells fall, help to direct battery firing.

For this purpose they need means of communication with the earth or with other air units. This has already been effected by the use of wireless telegraphy. At the beginning, those who controlled the firing transmitted

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their directions by alterations in their flight. Later, rockets were used as signals. But it is only by wireless telegraphy that we are beginning to obtain full, clear, and precise information. Its one drawback lies in the fact that it is not secret.

The problem of numbers is at present more important than any other, because it is easier to solve than that dealing with improvement of type. Our aeroplanes are not capable of maintaining a permanent watch ; they work in reconnoitring parties which go up at intervals. So far, there is a lack of pilots rather than of machines. When pilots become more numerous, there will doubtless be set up a permanent watch over the whole front. The tendency is in this direction, it will soon be realized. Then chasing groups will cruise about all day long at different altitudes above our lines, ready to bar the way to any hostile force flying against us.

Offensive expeditions will also resemble those of real armies. At present they are only 'raids.' Progress, however, is rapid ; on the 20th of March, 1916, for instance, a squadron of about fifty British, French, and Belgian aeroplanes and sea-planes, accompanied by fifteen battle-planes, raided the naval station of Zeebrugge.

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When Germany began hostilities she had fifteen hundred aeroplanes. While she may have lost some hundreds—three hundred and sixty-eight up to the end of March 1916, according to Italian statistics—she has certainly built many more ; the war aeroplanes now armed may be reckoned by thousands. The daily fights in mid-air already evoke visions of those battles in the clouds which before long will accompany the clash of infantry on the earth below. Up to July 1914 France possessed sixteen hundred and eighty-nine certificated pilots, while the German and Austrian aerodromes had issued only seven hundred and seventy-five certificates. The Frenchman, quicker to learn than the Teuton, becomes a skilled pilot in less time than his enemy.

## CHAPTER XVIII

### THE AEROPLANE AND THE FUTURE

**T**HERE can be no doubt but that the aeroplane will come to be used before long as a means of rapid transport, even in civil life. Many plans have been set afoot along these lines, and tentative efforts have been made to realize them. There are two great obstacles, however, though they will probably disappear in the near future.

To carry passengers, the machines must be of large dimensions; they must also be perfectly safe. The pilot, who steers simply with his arms and legs, will find it very fatiguing to control such huge machines, unless he uses auxiliary appliances of an effective power many times greater than his own strength. But all machinery is liable to 'go wrong,' and the slightest mishap, for however short a time, would, as things stand at present, jeopardize the lives of the passengers.

Thus the question of size is linked with that of security. True, in itself the stability of the flying machine increases with its size, because

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of the increase of the 'moments of inertia.' The latter oppose changes of position; their effect is to slow down every movement, and their importance quickly increases with the weight of the different parts of the aeroplane, and their distances from the centre of gravity.

Mechanical means of ensuring safety have been investigated by many inventors; their solutions may be divided into two categories. Either we trust to some automatic mechanism, as did the unfortunate aviator Moreau, for bringing back the aeroplane to a safe position when it is in a dangerous one—in which case this very mechanism, if it got out of order, would necessarily endanger the aeroplane—or we content ourselves, like M. Doutre, with giving the pilot a vigilant automatic control which, if the occasion requires it, acts of itself, but without ever overriding the action of the aviator. Pilots rightly prefer this latter type of security to the former, for no mechanism has ever been designed which does not go wrong from time to time.

In any case, it is probable that both systems will be tried before a final solution is reached: mechanism beyond the pilot's control, but in a form made so safe that jamming would be almost out of the question; and models at once so sensitive and so powerful that the pilots,



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in imitation of Moreau, may fold their arms as they speed along.

Even so, these guarantees will prove adequate only when a practical parachute has been designed. Experiments already made give hopes of success before long.

The number of passengers in one of these ' aerobuses ' of the future is still too problematical for us to compare them with motor-cars, consequently it is impossible to say what number of effective military forces will travel through the air. Still, we may point to the fresh increase of speed introduced by the aeroplane for transport service. Instead of ten miles an hour on the ground, troops will travel at not less than seventy miles an hour on the clouds.

Another element to counterbalance this progress is manifestly the expense, which is bound to be far greater along an air track. We must not forget, however, that there is nothing in the aeroplane that corresponds to the wearing out of wheels by friction. But that is by the way ; almost all progress is accompanied by expense, which puts no check on human effort. When dealing with the military efficacy of some new means of action, we must never regard it as unlikely that the enemy will make the necessary sacrifices. No more imprudent

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view could be adopted. Before the war took place we did not believe in the mighty preparatory efforts made by the Germans, the result being that we have had to pay more than it would have cost us to make preparations on a like scale.

Air transport alone would completely change the aspect of the struggle as well as the strategic methods employed. In the first place, it would amount to an almost instantaneous displacement of troops. By a devious flight in the rear, a general might steal away with the whole of his army in a single night, and transport it to some unexpected spot. He would bring it down to earth in battle formation. Finally, if he were undisputed master of the air, he might deposit his forces right in the enemy's territory.

We must remember, however, that such an army, unprovided with its material, which will always cling to the ground, would not be in a position to engage in normal military operations. Nevertheless, we cannot consider this hypothesis—which is capable of being realized on a greater or lesser scale once the aeroplane becomes an actual means of transport—without wondering what will be the fate of the communication lines and the services in the rear, thus threatened with a hostile attack.

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In these operations, no distinction can be made between transport and fighting. Before carrying passengers, the aeroplane will have carried weapons and made use of them. We know that it can drop small arrows and bombs, that it can carry one, two, and even three machine-guns. One of our small modern aeroplanes is capable of dropping from one to two thousand small arrows, which are as deadly as bullets. There are many kinds of bombs in France, which need not be described now. Most of them consist simply of artillery shells, of a calibre of 90 or of 155 millimetres. An aeroplane can carry a dozen shells. This is not a large number, and is all the more inadequate from the fact that the aviator is unable either to stop for the purpose of correcting his aim, or to aim at all except in a vertical plane.

It is not beyond the bounds of speculation that motionless support may be effected by means of a horizontal screw. Colonel Renard has proved that this is at present impossible, having regard to the inadequate horse-power of modern motors. Granting that we shall always have to contend against the same impossible conditions, we may yet ask ourselves if machines might not be built, capable of a slow perpendicular descent, by the use of vertical planes for maintaining the requisite stability.

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In this case the aviator might remain momentarily almost directly above a point aimed at, and correct his aim. To compass this with greater ease, he would doubtless be supplied with tracer bombs.

Another improvement would consist in the use of a small mortar, or a sort of catapult, to project the bombs horizontally, and to cover the ground on a belt two or three hundred yards wide. The aviator would use special range-finders, and his sights would be so graduated as to take his own movements into account, like those used in launching torpedoes; he might thus extend his field of action at will, right and left of his own track. On some chosen objective he would drop a shower of shells, so calculated that at least one of them would fall within a given area; or, again, he would sweep a given area by exposing it to curtain fire from above.

Evidently these methods of firing presuppose a considerable supply of projectiles. But the first improvements will be made along these lines. Neither for observation nor for fighting purposes does the aeroplane need more than two passengers, for both of whom room is already provided. The store of petrol is at present amply sufficient, as our aviators have proved. The field of action is no longer limited by the

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amount of petrol carried, but rather by the powers of endurance of the pilot. The raid on Karlsruhe took six hours to accomplish. This is practically all that can be expected of a well-trained aviator, under the present conditions. To-day it is scarcely possible for several reasons to exchange pilots *en route*. This will only be done when greater security in the air has been achieved.

There is one rival of the aeroplane: the dirigible balloon. The war has shown that the latter, although much more expensive to build, possesses no very marked advantage over its rival, even where it may advantageously compete with it, *e.g.* in night raids over a wide area. Less adapted for reaching the upper strata of the air, more affected by violent winds, and forming a target easier to hit, the balloon exposes to danger more material and men. It may have its uses for the moment, but it will not be for long, in our opinion.

In spite of appearances, it is probably a more dangerous means of transport than the aeroplane, since its ascensional force depends on a substance which readily escapes—a gas; whereas the safety of the 'heavier than air' machine is due to rigid planes which continue to maintain it in the air even after repeated hits.

The Italian *Giornale dei Lavori pubblici* states

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that Germany, at the beginning of April 1916, had already lost forty-seven Zeppelins. She has continued to build them, however; the present model is said to be one of thirty-two thousand cubic metres, supplied with eight motors, developing 1600 h.p. It is said to fly at a height of twelve thousand feet, and can travel for twelve hours at sixty miles an hour. A Zeppelin carries from five hundred to a thousand kilogrammes of bombs, an aeroplane a weight in bombs of no more than one hundred kilogrammes.

All the same, it is easier to launch into the air ten aeroplanes than a single great balloon; and they are much more redoubtable instruments of warfare. The domain of the air may see several kinds of war machines: the aeroplane will remain king of them all.

Here, as elsewhere, we see that the conjunction of arms is productive of the most far-reaching results. It is a manifestation of the principle of solidarity, an application of the idea of concentration. One with the arms of earth, the aeroplane is also one with the other air machines. Above all, it is used along with them for purposes of observation and for regulating artillery fire.

As is well known, Captain S—— conceived the idea of sending up an observer by means of

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a great kite. The kite remains in the air for a long time, and the watcher is stationary. For over a century the captive balloon has enabled men to rise above the battle-field. The balloon, however, is too vulnerable a target to be exposed near the firing line. Frequently it has another drawback : the wind, by beating down its cable, brings the balloon back to the ground.

Whereas the spherical captive balloon behaves badly in a wind, the kite cannot dispense with it. So the idea was conceived of combining their qualities by the creation of kite balloons. These are air floats, of a long-drawn-out shape, like the dirigibles. Hence they have been called 'sausages.' Made fast at one end, they move about in the wind somewhat like the kite of a child, though to a certain extent they control their own movements.

Consequently, we have the two different forms of obtaining information : from the air observer who is ever present, though stationary and somewhat too far in the rear, and from the mobile reconnoitring parties which fly above the enemy's line from time to time. A more direct collaboration between aeroplanes and balloons might become possible. Nothing compels us to suppose that the automobile bird, in spite of its immense advantages, will cause the disappearance of its ancestor, the

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'lighter-than-air' machine. As a rule, arms that succeed one another continue to exist together and become specialized; and their best reason for not suppressing one another is that they can render mutual service. If we inquire what help the balloon, particularly the captive balloon, could give to the aeroplane, we may imagine one quite unlooked-for field of activity: might not the balloon serve as a perch for the aeroplane?

The latter cannot remain motionless in the air, nor will it ever remain there without manœuvring. Yet a stationary position would on occasion prove useful. If it is forced to descend, whether for purposes of rest, for having the motor examined or obtaining a fresh supply of petrol, it loses one of its most important gains: height. If our aviators in the entrenched camp of Paris had been able to follow the 'Taubes,' not from the surface of the ground but from a height of a thousand metres, they would have gained seven or eight minutes, equivalent at least to as many miles. Now, there is no reason why a balloon should not rise in the air, with two or three 'sentry' aeroplanes hanging to it from specially arranged cables.

These would have some difficulty, on starting, in releasing themselves. Though this problem



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may for the moment offer no solution—in the absence, however, of experiments along these lines, we cannot affirm such to be the case—it will evidently cease to be insoluble when the aeroplane becomes capable of supporting itself *in situ* or of slackening its speed to any great extent. Once this is possible, it will no doubt succeed in hooking itself on to a specially arranged trailing arrangement hanging from the captive balloon. An air reconnoitring party, instead of wasting the time necessary for rising, might dart forward immediately ; it might also find a temporary resting-place.

Naturally, it is exposed to attack by the enemy, whose secrets it wishes to discover. A rifle or machine-gun bullet ascends to a height of about eighteen hundred yards ; the ' 75 ' shell to a height of over four thousand. It is very difficult, however, to take correct aim at so mobile an objective as an aeroplane. Its exact height and speed are not known, and its movements are so unexpected as to prove very disconcerting. Though range-finding and firing stations may be organized—and these will manifestly be greatly improved in the future—it is not often possible to hit an enemy aeroplane flying at a height of eighteen hundred or two thousand yards. Even when hit at a lower altitude, it is seldom brought to a stop.

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Holes in the wings do not prevent it from continuing its flight. To bring about a catastrophe, a vital spot offering but a small target must be touched: the aviator must be killed or seriously wounded, the tank perforated, or some important controlling lever shot away. As a matter of fact, our bird-men make light of the firing. They come down to within one or two hundred yards from the ground before dropping their bombs. Very few of them are hit from the ground. Their principal foe is the hostile aviator.

If it were possible to deaden or muffle the sound of motor and propeller, this would mean a great step forward. It would prevent their presence being heralded for miles around. They might suddenly dart out from the blackness of the night, from the fog bank or the clouds, in pursuit of their mission. It is quite easy to imagine that, at some future time, when the air tracks are continually being traversed by innumerable flying machines, the sound of whirring propellers will blend, far more than it does now, with the continuous roar of air traffic. It will have ceased to attract attention.

Another step in advance consists in lessening the visibility of the machine by making its wings of some transparent material. The

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Germans are said to use *cellon* for this purpose, a kind of non-inflammable celluloid invented by two Frenchmen shortly before the war. With the same end in view, they have covered certain Zeppelins with a bright aluminium dust, which reflects the light.

To imagine the state of the atmosphere, furrowed in every direction by airships, we have no other standard of comparison than the sea and the vessels ploughing its waves. In spite of the manifest differences, progress will be somewhat on the same lines. Aerial strategy will be a development of naval strategy, though strange variants will be introduced !

The universal law of specialization will have the same consequences in the air as on the water, and will affect first of all the field of decisive encounters. In both cases the struggle will normally admit of two successive phases : to achieve victory, mastery must be first established of a purely professional kind : in naval matters, mastery of the sea must be acquired ; in aviation, mastery of the air. Only then can we profitably begin operations against forces on land.

Since mastery of the sea is mostly won out in the open, so mastery of the air will be decided in the loftier planes of the atmosphere, out of reach of most of the guns below. The question will be settled by airmen themselves. The war

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in the open will have for its theatre a certain zone, limited below by the reach of shells fired from the ground, and above by the rarefied atmosphere beyond which the aeroplane cannot ascend. One at least of the opponents will always find it to his advantage to reach this theatre of action, beyond intervention from below ; and his initiative will compel the other to follow him, to avoid being dominated and bombarded from above.

Consequently there will be much manœuvring to gain the advantage of superior altitude, just as sailing vessels used to tack and veer in order to benefit by the wind. Hostile forces, however, will follow one another, each endeavouring to obtain the advantage in height. The atmospheric layer in which their combats will be decided will probably not be very deep ; artillery on the earth below will ever be hurling to a greater height its effective projectiles, whilst the ascent of the aeroplane is far from being indefinite.<sup>1</sup>

Combatants must naturally get within fighting range. This is necessary, even when attempting to drop bombs on a flying enemy, so difficult to attack when directly below by reason of his great speed. Other weapons, too,

<sup>1</sup> Up to 1st May, 1916, a height of over twenty-two thousand feet had been reached, but this was an exceptional feat.

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will be used in air fighting. In addition to the vertical firing from above downward, which enables large bombs to be used, machine-guns and small cannon will be able to fire horizontally or at an angle. Lastly, the mechanical bird will be capable of acting by impact.

Consequently we may look forward to three kinds of 'aeroplanes of the line': those that specialize in altitude, light and rapid ships, since immense speed is the sustaining element in a rarefied atmosphere; those that specialize in impact, and are armed with a ram; and aeroplanes mounting guns, and weighted heavily by their artillery. The first two categories may perhaps be grouped together, their common quality being rapidity of movement. The monoplane would appear to be specially adapted for this *rôle*.

There are three elements of naval warfare that have no counterpart in aerial warfare; these are: heavy armour-plating, necessitating weights irreconcilable with flying; the invisibility of the submarine, another form of protection; and heavy long-range artillery. In the air, fighting will take place at close quarters, except in a vertical direction, when opportunity offers. The dashes will be rapid and terrible. The vanquished, hurled headlong from a height of fifteen thousand feet,

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on reaching the ground will be reduced to pulp and smoke . . . unless ingeniously contrived parachutes transform the descent into an agreeable outing.

Air squadrons will advance in cubic formation ; ✓ they will blend in furious charges, dropping on to the plains below a deluge of bleeding and battered *débris*. The horror of these fights, which will darken the very sun itself, will surpass everything that man has ever known. The victorious fleet, quickly followed at a height of a few hundred feet by the heavy fleet of bombing and troop-transporting 'planes, will invade, like a huge flock of birds of prey, the territory of the vanquished foe, hurling all around fire, destruction, and death.

## CHAPTER XIX

### AT SEA: THE IRONCLAD

**W**E will now leave these dizzy heights and come down to the water. The seas will be the fighting area of three formidable types: a chimæra, the hydroplane, gliding down from the heights to perch lightly on the surface of the waves; a hydra, the submarine, whose periscopic eye and breathing nostril are the only parts that emerge above the water; and an enormous monster, the ironclad, whose sides and back, and even its hull, will be protected by a heavy carapace.

The sea is predestined for the transport of men and goods; it is the world's highway. International development will cover it with an innumerable crowd of freight steamers and mail packets. It will also be the common battleground, on which, as in the air, the armies of States as far asunder as the poles will join issue, and the wealth of international traffic will move to and fro, a prey to the victor. The sea, pre-eminently the track along which

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commercial exchanges are made, is bound to be the chosen theatre of warfare. Finally, it offers a way for military invasion by the oceans. The transport of troops by air is inevitably restricted to men and light material. Heavy material will have to be transported by water.

The world-wide progress of machinery will but enhance the importance of naval might. On the one hand, the value of commercial fleets and the utility of sea traffic, and on the other hand, the strength of overseas expeditions, will develop with the progress of machinery. We are living at a period in which the means of transport oversea have not yet come to correspond with the effective forces capable of being mobilized. The latter, however, have very nearly reached their utmost limits. Some day a nation will be able to land its entire army, in one mass, on a distant shore.

It is as an auxiliary—or, if preferred, as an intermediary—of land warfare that maritime warfare will always retain its principal interest. The supremacy of an action on land cannot be questioned : by such action alone is the hostile nation affected in its inmost being. But wherefore set in opposition the two forms of military power ? They are destined always to co-operate with each other !



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Although, speaking generally, the first task of the fleet in point of time is to fight the enemy on the sea, naval forces have always been essentially capable of acting, directly or indirectly, on land forces. The present war has shown how extremely useful they are in this respect. Their influence has made possible the transport of British armies to the Continent, that of the French colonial troops across the Mediterranean, the Allied attack on the Dardanelles, the German expedition against Courland, etc. The guns of the North Sea flotilla fought the Germans for the possession of the sandhills on the Belgian coast, near Nieuport. No need to mention the colonial expeditions, the most important of which was that of Japan to Kiauchau.

However, what was expected by everybody, viz., the clash of heavy squadrons, did not at first come about. They did not meet simply because each of them remained in harbour, out of danger from submarines. When war was declared, the German squadron, concentrating its forces in front of the Straits of Dover, was cruising off the coast of Belgium. The arrangements made, along with certain details revealed to us, prove that it had been ordered to bombard Havre and Cherbourg, then to sail rapidly to the entrance of the river at Morlaix and to

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Morgat in the Bay of Douarnenez, to protect the landing of troops (largely made up of American Germans brought direct to the spot) and thus take Brest in the rear on both sides. On the 1st of August, however, the British North Sea Squadron, although at the time it was not greatly superior to the German naval forces, took up positions which threatened their retreat. The decision of Great Britain was still uncertain. Nevertheless, the German admiral became uneasy and returned at full speed to Cuxhaven. The mastery of the sea was won without challenge.

Future fleets will be in a position to transport millions of men to some distant shore. Probably the disembarking material, which we still lack, will then have been provided. In the Dardanelles, an initial attempt was made with a large steamer, the *River Clyde*, the interior fittings of which had been removed so as to transform its hull into a sort of long tunnel. Driven at full speed on to the beach of Cape Helles, it ran aground, its bow almost touching the bank. Large doors, prepared beforehand, were then opened at both ends. Barges and transports came alongside, and used it as a landing-stage. Men, carriages, and guns passed through without difficulty, and then found an

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inclined plane which brought them to *terra firma*.

Ironclads have been held up by such obstacles as coast batteries, floating mines, and submarines. Failure has mostly resulted from the fact that the vessel has not been adequately fitted for operations against land defences.

Specialization of function has not yet been carried far enough. The force of circumstances will, however, bring this about. The line vessel, intended for naval combat, will be kept distinct from floating batteries, constructed for operations against forts. These latter will not need to be very swift vessels. They will draw but a very few feet of water, in order to come close inshore and to reduce the risk from torpedoes. Thick plating will be necessary, both above and below the water. Probably we shall reach a type carrying a single gun, of the largest calibre that a vessel can mount.

Progress in specialization, the necessity for which we have just shown, is even now beginning. Without entering into details which may not yet be revealed, it is possible to mention one application of this specializing process, which has been described in the Press. This refers to the monitors, which were first used in the Dardanelles expedition. *The Daily*

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*Mail* of the 20th October, 1915, describes them as follows :

"The next arrival caused somewhat of a sensation, not only to the enemy but also to our own troops. One afternoon, there appeared at the entrance of Kephalos Harbour an amazing-looking object. She could hardly be said to steam up, but rather wobbled into port, like a huge goose primed for Michaelmas. It was impossible to tell at a distance whether she was broadside on or showing her bows or her stern, for she seemed to be quite round.

"Her high side held aloft an absolutely flat deck, on which nothing showed except an enormous turret, from which projected two guns of enormous girth and length, while rising from her centre, like the giant of some Californian forest, was a huge striped tripod mast, bearing aloft a kind of oblong jewel-box, the exact replica, on a huge scale, of that in which the Dalai Lama bears about with him the ashes of his first embodiment.

"Sensation followed sensation. Her crew began to bathe. Apparently all possessed the divine power of walking on the water, for, on descending the ladder, instead of plunging into the waves, they walked along by the side of her, and, having thus distributed themselves,

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proceeded to dive in, only to climb out again a few minutes later at their will.

“ These huge monsters carry naught but two fourteen-inch guns and some anti-aircraft armament. They are roomy and comfortable, unlike their smaller neighbours. Their speed is very slow, on account of their strange shape, and they steer badly, but at present their development is only in its infancy, and they are interesting because in them you see the germ of what will probably be the battleship of the future.

“ The first time one of these monitors went to the mouth of the Dardanelles to calibrate, she gave the poor old Turk a horrid shock of surprise. Her guns go off with a terrible roar and carry over three-quarters of a ton of metal fifteen miles. Later on three more of these monsters arrived, giving us eight fourteen-inch guns with which to bombard the enemy's positions, in addition to a large number of smaller monitors of all shapes and sizes, some with names and some without.”

Such are the initial features of a new weapon characterized by adequate protection against the torpedo and power to attempt offensive operations against land forces : big guns and shallow draught.

We have seen that it is impossible to move

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along the present railway tracks guns of greater calibre than forty-five or fifty centimetres. An automobile gun-carriage on a firm road might allow of calibres of fifty-five or sixty centimetres. Platforms of concrete would, however, be needed for firing them.

On a floating platform, on the other hand, weights are distributed uniformly over the liquid mass, the resistance of which is indefinite. Size is limited only by the resistance of the gun-carriage itself, *i.e.* of the vessel, and there is scope here for the realization of gigantic engines of destruction.

The one-gun monitor need therefore be inferior to the coast battery neither in range nor in weight of projectile. When both are evenly matched, it has so far been exposed to a double disadvantage arising from the deadly danger it incurs in the event of the slightest damage below or near the water-line, and also from the ease with which the enemy can rectify his aim. For shells, when falling into the sea, raise huge jets of water, visible from a great distance. The first drawback will be mitigated by protection against the submarine, the second will be wholly removed by the use of smoke curtains.

Here we have a method—the first signs

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of which have already appeared, though considerable development is yet needed—to ensure that the fire of the vessels is decidedly superior to that of the forts. The boat is mobile, and can choose its own time: these are the two advantages which it enjoys against a motionless enemy.

Let us first consider what has already been done. On several occasions use has been made of artificially produced smoke curtains, either to conceal Zeppelins or to protect vessels from the enemy's fire. On the 2nd July, 1915, for instance, Russian cruisers were pursuing a German light division near the island of Gotland. Before long the *Albatros* was severely damaged. To hide the vessel, German torpedo-boats surrounded her with a dense veil of trailing smoke. The same thing happened at the close of the naval battle of Jutland, on the 31st May, 1916.

A squadron, then, which has the choice of day and hour, *i.e.* of wind and light, will be able to approach a coast and yet be preceded by a concealing curtain. In certain cases at least it may possibly continue to see enough of the coast to ascertain its own position and regulate its firing by indirect aim.

However, the general solution of the problem takes for granted that the assailant will be

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master of the air and kept informed by his aeroplanes of the effect of his fire.

It also takes for granted the organization—not a theoretical impossibility—of indirect firing which shall not depend on seeing the coast at all.

On land, a concealed objective is easily hit if its geographical relation to some other visible point is known: the latter is aimed at through a sight which, according to a previously calculated rectification, gives the requisite angle with the true line of fire. In the present instance, there would be set up on board ship a fictitious target, set in accordance with the map, and rectified by information received from the observer in the air. It must not, however, be subjected to the pitching and tossing of the ship, and allowance would have to be made for angular displacement due to the ship's progress through the water. The properties of the gyroscope supply a clue to the solution of this problem. All that the gunner would then have to do would be to adjust his line of aim to the fictitious target and to fire at the moment of coincidence.

In the case of a mobile and hidden vessel, the gunners in the forts would not know where to fire, whereas seamen, acquainted with the



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unchanging outline of the land and their own position with reference to it, would always be in a position to work out the problem.

Mines and torpedoes are also formidable foes of the ironclad. When the matter comes to be taken up seriously, however, we shall not be so helpless against them as we think. Fixed mines, anchored to the sea-bottom, may be swept aside by a system of steel cables external to the ship; there is also the fleet of mine-sweepers. Floating mines, like self-propelled torpedoes, will necessitate more cumbersome, though perfectly realizable, methods of protection. No ship's side could withstand the direct shock of their explosion; consequently, under-water armouring would be inadequate; it must be supplemented by a suitable shock-absorbing 'mattress.' In order that there may be no change in the equilibrium of the boat when a large portion of this cushion is beaten in by the explosion and exposed to the water, it would appear absolutely necessary that water should enter it at all times. We thus come to forecast that protection will be by means of a sheet of water superimposed on metallic armour.

What must be done is to explode the torpedo away from the hull of the ship, along an outer

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belt, perhaps two or three yards distant. Instead of the usual torpedo net, which cannot remain in position whilst the ship is in motion, the ironclad will carry a kind of second hull of thin metal. The space between the two hulls will communicate freely with the sea. This system will require for the ship an increase of width and of friction. It will necessitate a sacrifice of speed and an addition to the tonnage. Safety, however, is a thing upon which too high a price cannot be set.

Thus fitted out, the ironclad will very probably continue to exist. Indeed, the reasons why it must live on are irrefutable. It represents power. It plays on the sea, amid an innumerable marine populace, the *rôle* of policeman on a public square. It controls both sea and shore ; that is, it either forbids their use altogether, or leaves them free for the transport of troops, goods, and supplies belonging to the various belligerent States. These means of applied action, feeble in themselves, will always demand the protection of specialized escorts. The escorts will come into collision with more powerfully armed combinations, and that unit which dominates the other naval units will control the situation. Mastery of the sea is still the preliminary condition of all naval enterprise in war-time.

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The most redoubtable foe of the vessel of the line will assuredly be the aeroplane, with its bombs falling on armoured decks and turrets. But here also smoke may envelop the ironclad and thus prove its safeguard.

## CHAPTER XX

### THE BLOCKADE

**T**HE ironclad is the main arm specially devoted and almost limited to achieving results pertaining to naval science. The consequences of its triumph, the practical utilization of the mastery of the sea, belong to other branches which carry out the detail work. One of these, intended for the use of artillery against land forces, is the gun-platform already described. Another is the bridge-boat, first seen in the Dardanelles expedition, and used by infantry forces for disembarking men and material. Others, again, effect the transport of troops as well as of military or non-military supplies ; they use the sea, not as a battle-field, but as a pathway for the passage of persons and materials.

The final instrument of applied maritime activity will be the ' corsair,' if we adopt the word with a change of meaning. We no longer know the old-time privateer, the merchant captain who had received a letter of marque authorizing him to make war ; the Declaration of

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Paris in 1856 abolished these freebooters for ever. Nor, indeed, is there any reason for their existence, now that the various States are sufficiently powerful to requisition the ships they need. By assuming responsibility and control of men and material, a nation's navy possesses the advantage of unity of action, a precious asset.

To avoid coining a new word, we may give the name of 'corsair' to the destroyer of the enemy's overseas trade, to the chaser of merchantmen. In this case he ceases to be defined by his original nature or his special status, but rather by his function for the time being. The chase becomes an occupation for vessels of every kind, according to circumstances.

In the present war, where everything changes as time progresses, 'privateering' has assumed various successive forms. It began by occupying the stage with feats that made great stir. The Germans had prepared for it very carefully. Their swift cruisers, found on every sea, supported by German colonies or supplied by neutral vessels, according to appointments made beforehand or transmitted by friendly agents, were for long able to escape the allied fleets which were scouring the seas. Yet they disappeared one after the other; those that did not succumb took refuge in neutral

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harbours, where they were disarmed. The losses they caused to our commerce amounted to little.

Surface privateering, thus condemned by experience in its normal form, again came to life under a disguised and singularly treacherous form, of which the best known instances are the *Moewe* and the *Greif*.

The Germans built half a dozen ships, outwardly resembling ordinary merchantmen, though extremely rapid and planned to fulfil a special rôle. There is nothing to prevent the transformation for this purpose of genuine freight boats rendered useless by the British blockade. Accordingly, a peaceful-looking merchantman slips out to sea, not a smart mail-steamer, but an ordinary modest 'tramp,' which, however, carries guns and a fighting crew. It has been converted into a pirate. If occasion requires, the crew disguise themselves as ordinary merchant seamen; the guns disappear at will, the vessel hoists a neutral flag, and in this meek and mild fashion moves about amongst the world's fleets without arousing suspicion or distrust. Out in the open, when it comes across an English or a French vessel, it opens fire and sinks it.

The *Moewe*, indeed, was accompanied, on leaving Kiel Harbour, by three submarines,

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whose *rôle* it was to attack such British war-ships as might have stopped, captured, or sunk the German privateer. These submarines, says the *Naval and Military Record*, reported that they had left the *Moewe* quite safe, and that the voyage round Ireland and Scotland had been made without any difficulty.

Owing to its disguise, none of the many cruisers and ironclads encountered suspected the trick. Besides, the *Moewe* flew the Swedish flag, and all on board spoke Swedish, so there was really very little danger.

It was probably owing to a lack of confidence in its own disguise that the *Greif* was sunk by the cruiser *Alcantara*, for she made a clumsy attempt to escape by flight, as stated in an account published a few days afterward. A survivor of the *Alcantara* gave the following report of what happened: "For two hours we gave chase. Though she was flying a Norwegian flag, and had the Norwegian colours painted on her hull, fore and aft, the suspected steamer nevertheless refused to stop, in obedience to our signals.

"Finally, after catching her up, we fired a couple of shots across her bows as a token that if she did not heave to we should not hesitate to sink her. This time she stopped, within a distance of less than a hundred yards, and signalled

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that she was a peaceful Norwegian trader. Whereupon the captain of the *Alcantara* replied : ' Wait a moment, I will send a boat.'

" At once the scene changed. No sooner was our boat launched than the screens which concealed the pirate's guns were removed, and we saw that the *Greif* was formidably armed and ready to attack. A moment later a shell struck our boat, killing three sailors and hurling the rest into the water. Meanwhile, the enemy was attempting to torpedo us. The first torpedo missed its aim, but the next two struck us, causing enormous damage.

" The captain of the *Alcantara*, who had ordered the entire crew below, with the exception of the gunners, now opened fire. A desperate fight began on both sides, but although handicapped by the shortness of the distance separating us from our opponent, we got the better of him."

As is well known, the two vessels sank almost simultaneously.

Such is the new method, which will necessitate special police measures ; but it is nothing better than piracy, and its consequences cannot be very serious. It is not easy to generalize a subterfuge which compromises neutrals. Search will reveal the true calling of a ship with evil designs. It will be caught by one or more adversaries, disguised like itself ; plain-clothes



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policemen, so to speak. As cunning calls forth cunning, the French or English captain will also acquire the habit of sailing in the open sea under a neutral flag. He will arm in self-defence. The state of general insecurity resulting from these violent methods, the incidents to which inevitable mistakes will give rise, will compel a return to order and honesty.

These facts, however, emphasize the transformation, already mentioned, in both the methods and the conditions of warfare; this latter, by the force of events, affects in ever increasing degree the most varied commercial activities; it is impossible that overseas trade should remain unaffected in a world wholly involved in the tempest of war.

Besides, which are the vessels that play the greatest part in the activities of war and form its most frequent victims? Plainly, merchantmen. Since ironclads scarcely ever leave the roads, and the small cruisers, which alone represent battle fleets out in the open, do not often encounter hostile submarines, which carefully avoid them, contact between the opposing navies is effected between these submarines on the one hand, and on the other the liners which they chase or the trawlers and small steamers by which they are themselves hunted down. It is trawlers that sweep for mines, and that

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round up the submarines. They frequently fire at them, or are fired at by them. As for the large steamers which convey troops and supplies, they are the natural prey of the torpedo. They defend themselves, however, by ramming, and frequently with their guns. Since war is waged on them, they wage war in their turn.

For, indeed, faced with the inhuman threat of the much-advertised submarine blockade, we have found it necessary to supply defensive arms to merchantmen, which run the risk of being sunk without warning, or at all events of seeing crew and passengers abandoned in small boats to the mercy of the open sea. Experience has shown that safety lies in armament: there have been but few victims of the submarine among the vessels provided with guns, though they have been numerous among the others. As we have already pointed out, the non-combatant seaman has been compelled to fight.

This problem of the defence of maritime trade, which is also the question of the blockade, is one of the most important that the war has set us. Now that hostilities involve almost all the nations of a continent, certain belligerents are hemmed in by enemies on most of their frontiers. In former times, a central position had enormous advantages, however dangerous it might appear: frequently a hemmed-in

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combatant owed his most striking victories to this very position. He is more to be pitied now that the means of long-distance communication, *e.g.* by telegraph, enable the allies to effect a close co-ordination of their operations, without direct contact, over thousands of kilometres of the enemy's territory. At the same time, the increasing demands of war render the blockade more dangerous by closing the outlets to the sea, the one common medium of communication.

Henceforth no nation can long stand aloof from other nations. In almost all cases, the blockade will intervene to crush some one of the belligerents, and to incommode them all. By the blockade each country, as a whole, is brought into the condition of a besieged town. This is in keeping with the increasing solidarity between the civil population and the mobilized armies.

We saw a century ago, and, again, we have just seen, the mutual blockade between Great Britain and a Continental power. The arm conceived by Napoleon was worthy of his genius; it almost proved victorious over British tenacity. It owed its efficacy to the power possessed by the master of the earth to close and guard its outlets. Europe then comprised almost the whole of the civilized world: any country

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which it laid under an interdict was, in a sense, barred from all human intercourse. Things are not so now, and intercommunication between continents is in these days far more steady and regular.

The present double blockade, as will doubtless those of the future, no longer constitutes the "duel between the elephant and the whale"; the fight is entirely naval, between sailors and sailors, in the same watery domain, under conditions common to both sides, and with a clash of arms. But for the submarine, the situation would speedily find its solution. One side, after a naval battle, or the voluntary withdrawal of the enemy, would find itself sole master of the sea, whose surface offers no natural point of vantage enabling the passage to be guarded against the stronger side. The blockade would immediately become a one-sided affair.

The submarine permits the continuance of the double blockade, because, up till now, at all events, it has permitted the existence, circulation, and interaction of two hostile forces within the same space. By doing this, it changes the entire idea of the blockade and creates unexpected complications in international law. The development of its legal consequences is one of the most curious episodes of the new warfare.

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It acts in two ways : by transforming the conditions of the old form of blockade, with vessels on the surface of the water, and by inaugurating a blockade of a new kind. On the former point, it is not alone in showing a modifying influence. Because the army comprises almost the whole nation and war material has become more and more complex, we are led to include in the lists, first of conditional and then of absolute contraband, an increasing proportion of the imports of the enemy's country. It would seem as though we must go so far as absolutely to prohibit all commercial imports, either by sea or by land. For more than a year we refused to do anything in this direction ; the result will be that hostilities will be prolonged for, at least, an equal period. Needless to say, exports must submit to the same law ; they are the very breath of the blockaded country, gaining for it an increase of credit corresponding to their value, and in this way prolonging its power of resistance.

It will be necessary to have these restrictions recognized by neutrals. They would be the more inclined to recognize them if the blockade, as stated in the Declaration of Paris, could be made effective, *i.e.* maintained close up by visible forces so rigorously applied as to make certain the capture of any who attempted to

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run the gauntlet. But here the submarine plays a part. Its presence renders impossible a close blockade of the old-fashioned type; cruisers cannot now be kept permanently in proximity to an enemy's coast which is also a submarine base.

Consequently we must stop maritime commerce within a wider area, search all vessels sailing in one or more seas, and practise a galling supervision over transports supplying the neutral countries that border these seas. Each ship is asked for her papers. The declarations are verified; it is ascertained that the neutral coast is really her destination. Her cargo is then examined, in case she may be carrying to neutrals goods intended for the enemy. By making a *détour*, contraband goods can elude the blockade; for instance, they can enter Germany by the Dutch, the Danish, or the Swiss frontier, after being unloaded at Rotterdam, Copenhagen, or Genoa.

Since 1856 the master of the sea, who actually holds the position of blockader, has been acknowledged by international law as having a right of pursuit to check this smuggling. It has been considered that neutrals could not, without definitely taking sides, be permitted to screen one of the combatants from the consequences of his inferiority. Accordingly, in default of super-

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vision exercised by them for this purpose over their own territory or their merchant fleet, they allow the blockader to take the measures necessary on the common sea-way. These consist in withholding goods rightly suspected of being destined for the enemy, even when their first destination is a neutral country. This is the case in what is called 'continuous voyage.'

To avoid all doubt and dispute, however, proof is required of complete mastery of the sea as regards the blockaded coasts ; and the condition specified by the Declaration of Paris was this *effective* blockade kept up by an unbroken line of cruisers.

The submarine renders inapplicable the hitherto legal means of resisting indirect smuggling. Since the decisive influence and consequently the necessity of the blockade increase more and more, some new rule must surely be found.

What will happen ? At present, both adversaries are partially masters of the sea, each within his own sphere. Their respective strength at any one point depends on the distance to the bases. So long as this state of things continues and the evolution of naval science has not enabled one of the two principles—strength and invisibility—to overcome the other, both belligerent parties may claim the

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privilege of control over the maritime routes, at all events, each in some one area, imperfectly defined though it may be. Neutrals subjected to search at sea must decide either to accept the application of the extended right of 'pursuit,' or to decline it.

Since no clear criterion can indisputably justify such a decision based on the apparent equilibrium of two maritime forces which have no definite boundary, since the decision arrived at will constitute a great and evident advantage for one of the two combatants, to decide will involve participation in the struggle. There will be no point of balance for maritime neutrality.

The direct opposition of belligerent interests in the hands of neutrals leads to this result, since neutrals transport oversea merchandise capable of being used for war purposes. But must they debar themselves from maritime trade altogether?

A ship is more than ever a means of transport between nations. It has its own flag, and its home ports, but it works for everybody; in its holds are found the products of the whole world, on its decks are passengers of every land. The intermingling of private interests beyond a nation's frontiers is such that this confusion cannot be prevented. The difficulty of setting



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things to rights renders necessary a real collaboration between the captain and those who are carrying on the blockade ; the obligation to end the confusion would paralyse the maritime trade of all neutrals.

Even were a neutral to import only the commodities collected by its own traders for its own consumption, it would not escape the difficulties resulting from the neighbouring blockade. For there is one form of indirect smuggling which cannot be settled between belligerents and the individuals of neutral countries, but which of necessity involves the neutral State itself. Goods imported into Holland, for instance, once they are on the Dutch market, can be resold to Germany : in this case, smuggling is no longer a continuous act : it is split up into two deals, each of which is permissible. Some of Germany's neighbours have thus had delivered to them six or seven times the amount of their usual consumption of some particular commodity.

The neutral State should give proof of its good faith by accepting a limitation of the total imported in each category of goods. It interposes either itself or a central commercial organ between the navies enforcing the blockade and its own citizens.

Another difficult case is that of the products of its own soil or its own industry. It remains

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within the strict letter of neutrality when it purchases from abroad all that it will itself consume, and sells the whole of its own produce to the blockaded country.

Consequently, whether it checks or tolerates this support given to one of the combatants, in what will be henceforth an essential matter, it will have favoured one side or the other. Perfect neutrality no longer exists ; the least imperfect daily becomes farther and farther removed from perfection, and draws nearer and nearer to a state of intervention in the war.

So far we have spoken only of the new conditions created in the old type of blockade by the appearance of the submarine. We must now examine that blockade which the submarines themselves now claim to be putting into operation. However strange this claim may appear, it is an inevitable one, as we have said.

If submarine blockade is to be regarded as inevitable, we must also consider its consequences. The submarine cannot possibly take its captures to a safe harbour ; in many cases, too, the submarine cannot even search them. Consequently, the blockader is compelled to destroy his capture after examining it ; or even at sight, and without examination, to sink a ship that is merely suspected. This is a double

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obligation, if he would not both make his blockade a mere farce and jeopardize his own existence, where the merchantman, armed with cannon, may in turn assume the offensive. The helplessness of present-day submarines against shells puts them at the mercy of a simple cargo ship equipped with a light cannon, and forces them to be cruel.

But sinking a ship suddenly, without either warning or search, or even sinking it after due warning, means exposing to the sea both crew and passengers, crowded into small boats ; it is carrying on war upon non-combatants in all its brutal horror. Even were there on board only peaceful citizens of the enemy's country, the inhumanity of such a practice would arouse universal indignation. We are compelled to take sides either for or against ; neutrality of feeling in the face of such deeds is impossible.

But again, there will be neutrals on board ; we may expect that questions involving their welfare will frequently arise. The submarine renders possible a blockade which extends over a wide area, but it can exercise no discrimination. This almost inevitably leads it to claim the right to close whole seas to commerce. This spells ruin for the countries that allow themselves to be intimidated ; and, if the stream of trade is not interrupted, the number of blockade-

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runners, incurring the risk of being sunk, is increased.

It would appear, finally, as though submarine navigation were capable of giving the finishing stroke to the blockade by undertaking the transport of contraband. Hitherto, submarines, too few in number to be diverted from their naval task—the principal one after all—have received no commercial mission. Their tonnage is small, and they could carry but few goods. Then again, since they are all warships, they would not be admitted for mercantile operations into neutral ports, where they would have to submit to disarmament within twenty-four hours.

Things will not always be so. There has been talk of a submarine service across the Straits of Dover, or some other part of the English Channel, with a view to sparing passengers the terrors of sea-sickness. It is not unlikely that our grandchildren and great-grandchildren will see fleets of peaceful submarines, used for some such purpose or for certain undersea enterprises. On the other hand, submersible military transports will be able to go to allied countries for cargoes, or occasionally to receive out in the open sea some particularly important commodity. They will easily avoid cruisers. We shall examine presently the only safeguard

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to be considered from now onward against this and every other kind of submarine peril.

Yet the sea, after all, is easy to keep watch over, for the circulation of all commerce takes place on its surface ; the submarine, even, does not travel at any appreciable distance below the surface. The same problems will soon present themselves in another form, and with fresh complications, when the conquest of the air is completed. When the aeroplane is able to convey passengers and goods from place to place, we shall have an air blockade. How are we to decide upon the rights of neutrals and belligerents, amid an element in which swift action, without the possibility of pause or deliberation, is alone possible ?

## CHAPTER XXI

### THE SUBMARINE

**S**UBMARINE warfare has assumed the first place. It remains the only warfare permitted to the Power that has lost the mastery of the sea surface. By reason of the long duration of hostilities, it has attained a development which can no longer be compared with its early stages. Two new traits have appeared: the claim, insolent enough though stoutly upheld, that the British Isles are blockaded; and the sending of German submarines into the Mediterranean.

In July 1914 Germany had twenty-seven submarines in commission and about eleven under construction, five of these being intended for Austria. She commandeered five others, in process of completion for neutral countries. This gives a total of forty-three. In the arsenals of Austria there were six submarines and five others under construction. Of these fifty-four boats, mostly small ones, many have been destroyed. Twenty new ones, however, laid down in the yards since the outbreak of war,

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have long been armed, and forty others have followed them in turn.<sup>1</sup>

M. Laubeuf reckons that the Germans are able to repair their losses as they occur, and so maintain their effectives at an almost stationary figure. M. Lorenzo d'Adda regards the construction of submarines as being ahead of their destruction, and affirms that eight large submarines leave the German yards every three months.

These boats, owing to their greater displacement, possess a wider range of action than their predecessors. They are able to carry more food and munitions, and to keep the water for at least twenty-four hours without requiring a fresh supply of fuel. They are boats of about nine hundred tons, in which a considerable number of improvements have been made. Their existence appreciably affects the naval struggle.

The three main features that specially characterize this submarine offensive are the following: they can rest on the sea-bottom, renew supplies *en route*, and use cannon.

By resting on a shallow bottom, German submarines can without danger give their crews the periods of rest required during long cruises. True, this applies only to seas like

<sup>1</sup> Spring of 1916.

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the Baltic and the North Sea, where shallow waters abound, and to a few other restricted areas. Yet, the question may be asked whether floating anchors, consisting of flat buoys level with the water, so as not to be too easily seen, might not secure the same advantage in the open sea.

Supplies have been organized by the German navy in the bays of neutral coasts, either on land, where a boat could go for barrels of petrol, or in roadsteads, with the help of smuggling cargo boats. It must be remembered that, since the supply to a submarine of liquid combustible and certain articles of diet can be effected by means of pliable piping, this is a far easier matter even in the open sea than the recoaling of a boat on the surface.

Prolonged cruises, indeed, necessitate fresh supplies of munitions: torpedoes, very few of which are carried because of their cumbersome nature, and shells for the guns. These are things which neutral smugglers will have difficulty in supplying and which cannot be conveyed by the same method at sea. Besides, as there are all kinds of risks and complications with submarines, they need to return to harbour frequently for overhauling and repair. Consequently, their sphere of activity and duration of absence could only increase to any consider-



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able extent as the result of material progress yet to be realized.

Nevertheless, the Germans have succeeded in forcing their submarines through the Straits of Gibraltar. The great depth of this passage, the strength of the currents and the nature of the rock-strewn bed, made it impossible to apply the measures by means of which the Straits of Dover have been closed. The Mediterranean has thus become the main theatre of really military submarine operations, and there the war is carried on mainly between transport vessels and submersible torpedo-boats.

The small number of torpedoes carried—one of the weak points of the submarine—would have prevented it from playing an important part in the war had there not been cannon to fall back upon. For the future, cannon will be the one necessary instrument of the submarine, and since immersion has little effect on cannon, the mounting is a simple matter. Two types of gun are used by the Germans: the first, with calibres inferior or equal to 37 mm., are submersible and remain fixed on their swivel, above deck; the second, of calibres up to 88 mm., disappear within, under a slight bulge. With the help of powerful springs these latter are brought into position within twenty seconds.

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To meet the attack of submarines on merchantmen, the Allied navies have had to arm the latter with a few light guns. The danger thus incurred by the submarines is great, for the slightest hit either hurls them into the depths or prevents them from diving until they have been overhauled and the damage repaired in harbour. In this state they are at the mercy of the first hostile vessel they meet.

The German Admiralty thought they would overcome the difficulty, first by deciding to sink at sight and without warning vessels suspected of being armed, next by armouring in their new submarines the turret which carries the guns. This armouring was made sufficiently thick to withstand shells of small calibre. Thus we come back to a type similar to the American monitors, a specimen of which, the *Onondaga*, was acquired by France: boats capable of sinking below the surface at the moment of fighting, not altogether, but sufficiently to leave in emergence only the strongly armoured turrets.

We shall retort by increasing the strength of the guns supplied to our merchantmen. Shells from these guns will crash through the armoured turret of the German submarine monitors. Here we have a repetition of

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the struggle between armour-plating and projectile.

We also see that the new equipment has already effected a change in the character of submarine blockade. First, this blockade is essentially the work of the guns. Secondly, the mercantile marine is compelled to fight. For active defence it will daily have to supply itself with ever more efficient weapons.

The new German units seem to have a single motor for travelling under water and on the surface. This, in any case, is the ideal which submarine workmanship will certainly reach some day. Then the field of submarine activity will increase ; boats will be less frequently compelled to rise to the surface, which they do mainly for the purpose of recharging their accumulators by means of their surface motors. There will thus be few opportunities of taking them by surprise.

It will be possible to extend the blockade to the high seas. This could not be done while submarines were incapable of remaining at sea for more than two or three weeks or of making long voyages without renewing their supplies. Compelled to hide near ports of arrival, they were easier to watch and to capture, or at all events to paralyse. In so narrow a belt it

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was possible to take the most minute and complex precautions, such as could not be continued out in the open sea and during a long voyage.

## CHAPTER XXII

### FIGHTING THE SUBMARINE

**I**T is well known that necessary defensive measures were adopted long before 1916. The greatly increased numbers of trawlers, steam-tugs, armed yachts, torpedo-boats and destroyers have enabled us to create scouting departments, which are a source of serious danger to the submarine. If it shows itself on the surface within range of the gun of a patrol boat, it may, in a few moments, receive its death-blow.

Other methods, however, have been perfected. Some depend on sweeping tackle or fixed nets, others are based on observation of the peculiar ripples caused on the surface by the passage of a submarine. By carefully studying the surface of the water, we can perceive a wave accompanying the invisible foe. These are produced by the track of its conning-tower and its propellers. To very swift boats have accordingly been allotted the task of drawing attention to these faint signs as soon as they appear. The motion of the tell-tale

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wave marks the track followed by the submarine ; the scout goes on in front, and soon afterward, across the path of the submarine, nets are stretched, held in place by a couple of steam-tugs, which close them over the enemy as soon as he is caught. Then he can be landed like some huge fish.

In channels, at the entrance of roadsteads to be defended, permanent nets are fixed, hanging cables intended to be caught in the screws, and other contrivances for the destruction or capture of submarines. Probably nets will not be powerful enough to stop the larger ones, since they would be too heavy and would tear through the steel network as though it were a spider's web, while the propellers, protected by a guard, would also remain unentangled. Rupture of the net, however, might be made known by an electric signal, and give warning of the enemy's approach.

Again, by the aid of microphonic receivers, we hope to hear the sound made by the propellers in the water in time to get ready. Some day our inventors will effect the final adjustment of practical difficulties. An entirely new technique has come into being, and is attaining greater perfection day by day.

This includes torpedo-shells which, on touching the surface of the water, penetrate

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the liquid mass to attack the submerged parts of a vessel, and more particularly the hull of a submarine below the surface. We have also considered the use of small torpedoes for quick firing, which would be carried in large quantities, and which would always be powerful enough to deal a fatal blow at so fragile an enemy.

For look-out and chasing purposes, simple motor-scouts have been constructed, of 100 h.p. ; they burn petrol and have a speed of twenty-five knots an hour. They carry one gun and two or three men. The British Navy has received a considerable number of these from American yards. They are put on ships of the line, which take them to their hunting grounds and distribute them.

By means of all these sea sentries, scouting districts are formed, sufficiently patrolled to ensure the detection of submarines as soon as they rise to the surface. If we do not always hit them, at least we force them to dive hurriedly, we impede their movements, and may render it impossible for them to stay above water long enough to recharge their accumulators.

The surface of the sea was formerly a watery waste, as lonely as our own forests a few centuries ago ; malefactors were free to come and go as they pleased. It will become, first and foremost on all invested seas, if only in

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war-time and within a tolerably wide zone around the shores, a sort of public square with police on duty.

In this case, the submarine must either grow in size and only go forth armed to the teeth to defeat the watch, or conduct its expeditions entirely under water, not once appearing on the surface. It could not easily be deprived of the power to raise a scarcely visible periscope above the surface; but that is sometimes inadequate for clear vision, and, to fire its gun, it cannot but come to the surface.

Then, even when under water, it must beware of discovery from the air. As is well known, an observer right above the sea can look down into it to a considerable depth, within a radius that increases in proportion to his height above the water; the elevation of the eye increases the circle on which the glance falls almost vertically, *i.e.* within which the surface ceases to act as a mirror. An aeroplane can easily see a submarine which would be invisible to a ship. Moving about above the submarine, it sees it, often itself unseen, even if the periscope is above the water; for the periscope, which circles the entire horizon, cannot point toward the zenith. True, it would be no difficult matter to fit up a telescope for this purpose.

Flights of kites towed by ships, though they



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cannot move about as an aeroplane can, are nevertheless able to see as well as the latter. Besides, immobility is sometimes useful for a guard on duty. A single ship could easily guide a number of man-lifting kites flying at somewhat different angles from one another. It could keep watch over a whole sector: a very economical method and one that admits of considerable development.

The aeroplane, not content with spotting the submarine, indicates its position, observes and signals its direction and speed, and may even attack it. It appears that a seaplane, coming down to within fifteen yards of a German submarine, sank it with bombs: this was the *America*, the prototype of the great Curtiss machine, though carrying only half a ton. The same seaplane appears also to have sunk or at all events seriously damaged two other submarines by smashing their periscopes. When will boarding, the diving-ram, the winged harpoon, and similar tactics be adopted?

Captain Guidoni has shown by experiment that it is possible for an air machine to launch a torpedo. The practice was recommended in America by Rear-Admiral Fiske. 'Wireless' control of torpedoes is under consideration, and might well give good results, for the submarine, when under water, has no means of

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disturbing the progress of the torpedo, either by projectiles or by electric waves. Moreover, if the aeroplane that projects torpedoes can make them take the water a short distance from the hull of the intended victim, the problems of aim and propulsion will become greatly simplified.

One innovation of submarine warfare is the use of floating mines laid by submarines. The employment of mine-fields like those which proved so terribly effective in the Russo-Japanese War was foreseen ; at the very outset of the present war the North Sea was abundantly mined. The anchoring of these machines was effected by boats of a special kind, transports fitted out for the purpose or specialized cruisers.

The Germans not only sent out merchantmen with concealed armament, as privateers, but also employed merchantmen, sailing under neutral flags, to scatter mines about those areas which their warships could not approach.

Finally, their submarines themselves have conveyed mines, as might have been expected. Wherever the surface is forbidden to ordinary mine-layers, the submarine is utilized for the purpose. In the case of the Germans, this applies to all the seas ; in the case of their adversaries, to areas, large or small, along the

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German coasts, or in certain parts of the neighbouring seas. Submarines can carry only a few mines; no important results will be obtained unless their fleet is greatly increased in numbers.

The German navy seems to possess two different models. In the one, the mines are carried outside the hull of the submarine; they lie permanently in special recesses, suspended from a hook which is itself connected by a rod with the interior of the boat. The mines are liberated at will, by manipulating this rod, which turns the hook over.

In the other model, the submarine has a compartment provided with a large door opening on to the sea. At ordinary times this compartment is closed and contains no water. The mines are hooked on to a launching-rail, which is opened inside the submarine by means of a 'lock' through which a diver enters. The latter now lets in the water, slips out the mines, closes the door, and the compartment is again emptied.

This method is capable of considerable improvement. It is only the beginning of a new kind of warfare, the last-born of naval tactics. We may remind the reader of what we suggested four years ago: the fight between submarine and submarine is not an impos-

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sibility ; we can imagine it taking place in narrow straits, and in particular at harbour mouths, by reason of the mines and blockade nets which an invisible foe has laid down.

This would be a sort of copy of the sap warfare so extensively used on land. In presence of the increasing menace against the Allied Powers, masters of the seas, arising from the development of the German submarine fleet, we must study not only surface, but also deep-sea methods of defence, perhaps the only ones capable of providing a radical solution.

Submarines must be cut off from their base, either when they come out, to prevent their reaching the open sea, or when they return, to prevent their access to fresh supplies and to overhaul.

This question involves mastery of the depths, which must be acquired as well as mastery of the sea surface and that of the air if we would complete both the military and the commercial blockade. Only, while an aerial watch, employing a sufficient number of aeroplanes, may afford a relative mastery of the upper surface of the sea, the submarine, by diving deeper, may perhaps succeed in escaping detection when out in the open. It is therefore near the shores, in shallow waters and close to the

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entrance of harbours, that mastery of the depths can best be secured. To this end both aeroplanes and mines will contribute.

The function of blockading submarines would first be to destroy defensive nets and mines; for this they must have instruments which they do not yet possess, though these may be supplied later. Then they would have to lay down their own mines and nets, especially nets equipped at intervals with explosive charges, thus combining both means of action. Moreover, they would have to defend the area thus prepared to prevent sweeping by enemy ships working either on the surface or in the depths.

It is here, within narrow limits, at the points of support of the barrage systems, the pillars of the blockade, that we may conceive of submarine meeting submarine, a silent struggle between leviathians almost blind.

Previous possession of the surface waters along with mastery of the air would render the submarine capable of performing its mission in the depths. Co-operation of arms should extend to the three domains of water, earth, and air. On this condition only can monitors, safely sheltered in a sort of floating roadstead, succeed in remaining before the very ports of the enemy.

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The submarine, then, will have much to do ; it must combine many arms and numerous methods of action, carry equipment and supplies of various sorts, offer sufficiently comfortable accommodation for the crew to enable them to remain long under water, and to cross from one continent to another, adopt armour-plating, and attack with guns big enough to match those used by merchantmen. Large boats would be required for such a combination.

Submarines with ample free-board have already been thought of and designed. Shura-vieff's submarine armoured cruiser would displace four thousand five hundred tons on the surface and five thousand five hundred below the surface, going in the former case nearly twenty-six knots an hour, in the second fourteen knots ; it would have thirty torpedo tubes. Cuniberti's armoured boat, improved by M. Lorenzo d'Adda, reaches eleven thousand tons and a speed of twenty-five knots ; this, however, is not a real submarine, but rather an immersible monitor which cannot wholly submerge. It would fight with only two strongly armoured turrets, mounting light guns, appearing above the surface. Its principal arm would also be the torpedo. Post-Captain Sims supported a similar project

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before the American Parliamentary Commission in 1916.

This is an intermediate type, and shows that the 'leviathan' is still a logical necessity, both when partly emerging from the water and when completely submerged. Who then regards what has so far been effected as destined to supersede fleets of the line? We are going to make armoured submarines, great submarine transports, an entire navy similar to that of the past, except that it will be able to dive and move about under water. But nothing points to the conclusion that it will oust the surface navy; perhaps it will duplicate it. Complexity is the law of progress.

Whether partly or wholly submersible, ships of large displacement cannot avoid drawing many feet of water. This, combined with the great length of the boats, will render immersion in shallow water very difficult. There will be places, chiefly at the exit of a harbour, where these vessels are bound to be visible. Note the special conditions of the German coasts in this respect: they are surrounded by shallow seas. Here, within a fairly large radius, the submarines or semi-submarines of the open sea will lose their advantage. Will this be an advantage, or the reverse, to German naval power? . . . In any case, mastery of the

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territorial waters will here more than anywhere else be decided by cannon.

As for the submarine, we have no reason for imagining that it will bring about the disappearance of its enemy from the surface of the water. Many *do* think so, and the great exploits of German submarines have exaggerated, perhaps somewhat tardily, the esteem in which this type of boat is held. The principle of the submarine, however, is essentially a defensive one. Everything about it is subordinated to protection by water ; it is built with this idea in mind. The reason it retains a value in offensive action is that protection by water keeps it not only safe, but out of sight, thus introducing the additional active element of surprise.

The armour-clad, on the other hand, is the application of the principle of the offensive. First and foremost it is intended for carrying arms, guns, and torpedoes, ready for immediate use ; secondly, it is protected as effectively as possible by a belt of steel. It will always show itself superior in offensive.

At the present time the submarine is technically in advance of the battleship, as also of combatants in the air : hence its momentary success. If the Germans, instead of having thirty or forty submarines, had possessed ten times the number, the seas would have been



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closed to us. Undoubtedly, progress in numbers and in individual power will continue; we are far indeed from having reached the limit of the torpedo's destructive charge. But the submarine can never be cured of its two defects: its fragility and its relative blindness. These will always compel it to hide from the battleship.

The latter will find auxiliaries in slow-going aeroplanes, if ever there are any, or else in special dirigibles, attached, if necessary, to floating anchors. Air squadrons will flank them right and left, fore and aft. Glancing vertically downward, they will discover submarines below the surface. Once seen, these will be followed, and diving torpedoes, dropped from the air, will pursue and destroy them beneath the waves.

## CHAPTER XXIII

### ARTILLERY

**M**ECCHANICAL skill would have effected a transformation in the art of war, even had it dealt with transport alone. But arms also have profited by it. The more important of our weapons are highly complicated engines, ranking among the most wonderful that man has ever invented. There is no need to describe them. Everybody is acquainted with the main characteristics of, for instance, the French '75,' which affords the most perfect solution of a number of mechanical problems. Cannon is the deciding feature in present-day fighting. It makes it impossible for troops to advance over open ground. The French light field-gun fires nearly thirty shots a minute. These guns are in sufficient numbers to control the entire front, sweeping it with an impassable barrage fire.

To make headway, therefore, the enemy artillery must be reduced to silence. Here, as on sea, the struggle takes place at first between

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specialists : specialists in the arm of maximum power. The first duel is between long-range guns. "Superiority in this respect is all the more indispensable from the fact that the proportion of heavy artillery will continue to increase."

All the methods of the most approved military art will be used. Asphyxiating gas shells will scatter their trailing clouds, which, as they spread, are capable of reaching the gunners and their teams over a wider area than would be possible with fragments of a metallic projectile or with shrapnel bullets. Moreover, poison gases act for a considerable time, paralysing gun and battery in a more lasting fashion than flesh wounds. The effect of the latter is to suspend firing only until the wounded gunners can be replaced, whereas poisoned air sometimes remains unbreathable for several hours. True, the habit of wearing masks greatly reduces the efficacy of the chemical weapon.

Bombardment by aeroplanes, though difficult to regulate with sufficient precision in the case of a small objective, will doubtless soon prove superior to big gun long-range firing, which also lacks precision, and already requires assistance from the aeroplane.

Whichever method be used for winning this

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duel, the victor will immediately be able to ensure for his light artillery freedom of action within the area covered by his shells. He will then become master of the ground, though his success will be delayed and limited by whatever opposition the trenches can offer.

Modern armies employ guns of twenty different calibres, nine or ten of them belonging strictly to the land artillery, the others to the navy and the coast batteries. The calibre varies from the small 35 mm. gun to the 42 cm. German howitzer, the 'big Bertha.' Ranges of three and a half miles for the German '77,' of four and a quarter for the French '75,' of six and a half miles for the German '105' and of eight and a half for the French, attain to nearly nine and fourteen miles for heavy field and siege artillery of 130 mm. to 150 mm. calibre.

As is well known, mortars and howitzers are short guns, which fire with a small initial velocity, *i.e.* to a short distance, large projectiles filled with a heavy explosive charge. The trajectory is very curved, so that it clears any obstacles. The gun is pointed at an angle of about  $42^{\circ}$ .

Howitzers of 210 mm. or 280 mm. carry about five miles, the 420 mm. a maximum distance of nine miles, whereas long guns of

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305 mm. have a range of nearly sixteen miles. There are new calibres of even greater range.<sup>1</sup> The British fleet uses guns of 381 mm. calibre. The Germans have long possessed a coast gun of 406 mm. calibre, weighing one hundred and thirteen tons.

❧ We are now approaching the limit of heavy guns at present capable of being utilized on land, but progress in the quality of metal and in the chemistry of explosives will assuredly further extend their range. It is no exaggeration to expect that we shall some day destroy an enemy at a distance of over thirty miles. Such countries as Holland or Belgium, some two hundred kilometres in breadth, will have half their territory within the range of foreign guns just beyond the frontier. ❧

The German heavy howitzer of 280 mm. fires a projectile weighing close on seven hundred pounds and containing nearly forty pounds of explosives; the projectile of a Creusot howitzer of the same calibre contains about 90 pounds of explosives, though weighing only six hundred pounds. The 420 mm. howitzer fires a shell of nearly two thousand

<sup>1</sup> As a rule, the range of long guns in kilometres is indicated with tolerable accuracy by their calibre in centimetres. Thus a cannon of 40 cm. calibre should carry a distance of about forty kilometres, *i.e.* twenty-five miles.

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pounds, with an explosive charge of 250 pounds of picric acid, or of tolite.

The French 305 mm. 1902 model, weighing fifty-two tons, will fire a shell of seven hundred and fifty-two pounds, containing two hundred and forty pounds of powder. In the case of the Creusot 340 mm., the shell weighs thirteen hundred and twelve pounds, four hundred and forty-one of which are explosives. As for the 381 mm. of the British and German fleets, the weights of gun and projectile are, in Great Britain, two hundred and ten thousand two hundred and forty-five, and seventeen hundred and sixty pounds respectively, and in Germany, one hundred and eighty-seven thousand six hundred and eighty-seven pounds and sixteen hundred and twenty-two pounds, with a charge in both cases of nearly six hundred and sixty pounds. Finally, the 406 mm. German shell weighs two thousand and fifty-six pounds.

The explosion of such a projectile, producing the effect of a veritable artificial volcano, will pulverize any concrete parapet or armoured turret of a fort. The inhabited surface which has the misfortune to come under the fire of these monster guns will be swept bare and smashed to its very foundations.

Mention has been made of aerial torpedoes,

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a kind of small dirigible charged with explosives, and controlled, over a limited circuit, by a motor of the compressed air type, for instance. It appears that some of these, by means of an apparatus for receiving Hertz waves, obey the control of the gunners who project them. This forms a solution to the problem of telemechanical control. The projectile may thus be brought, as though by hand, down upon the enemy.

On the 11th July, 1915, the *Daily Mail* published information regarding a German air torpedo whose propulsion and 'lift' are secured through electricity. Control might be ensured by Hertz waves emitted from a Zeppelin. All analogous systems, though apparently so attractive, suffer from the same defect: the man who steers must needs see. Consequently the torpedo must be very visible and fairly slow. The enemy, however, as it approaches him, will see it better still, and will be able either to destroy it or to put out of order the machinery controlling it.

Whilst heavy artillery grows in size, the small gun diminishes. The '75' is a beautiful toy. Even more toylike models are made for motor-cars. The trench mortar, a recent arrival in the gun family, can fire a distance of no more than three or four hundred yards.

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In short, artillery has been adapted to every purpose and to all distances.

Guns, at the same time, are increasing in number. From fifteen to twenty thousand guns at least face each other along the French front, for a total force of five million combatants. There is one gun for every two hundred and fifty or three hundred armed men. The proportion of artillery will, of course, increase until we have one gun for every hundred men or less. Still, the main body of the army must consist of infantry and be restricted to small arms. Note that the present proportion was reached before the French Revolution, with guns individually far less powerful.

Indeed, mechanical contrivances will become even more widely used ; half the men will become gunners, veritable engineers of death : for the bomb-thrower and the machine-gun, the arms of the infantry, are but forms of trench artillery.

There are different models of bomb-throwers : some are small and very short howitzers, muzzle-loading and firing a ' Jack Johnson ' or a spherical shell. Of this type is the French ' crapouillot.' Others, like the cable-firing guns in the Navy, project a sort of arrow, its end, outside the cannon's mouth, being supplied



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with a large bomb or aerial torpedo. The arrow remains behind and falls a short distance away ; the torpedo crosses the few hundred yards to the enemy trenches. It carries in a thin shell an explosive charge of anything between a hundred and two hundred pounds.

## CHAPTER XXIV

### SMALL ARMS AND SAPPING

**T**HE machine-gun fires only rifle bullets, though at the rate, if need be, of nine hundred a minute. The best rate is somewhat lower, corresponding to three or four hundred. One machine-gunner is worth eighty men with rifles. The French began the war with a machine-gun section, *i.e.* two machine-guns, for each battalion, the Germans with four times as many. Since then, both sides have greatly increased their numbers. The machine-gun carries as far as a rifle : from two to four thousand yards, according to the type. In practice, we do not squander our munitions by firing at great distances : the terrible 'bullet pump' is used chiefly at ranges of less than a thousand yards, sometimes almost point-blank.

Like the bomb-projector, the machine-gun must be easily moved by hand. The French model weighs under fifty pounds and is carried by two men. Trench angles and strong points are supplied with these guns ; some are also

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placed behind the lines so as to cut short any hostile offensive which may have succeeded in breaking through the first obstacles.

The number of guns will continue to increase considerably. Thus we shall reach a total firing capacity and shall require supplies of ammunition far beyond what we see to-day, necessitating a huge organization of transport and means of approach. We must remember, however, that the increase of guns does not necessarily imply a proportionate expenditure of ammunition. Frequently its main effect is to afford concentration in time ; in a few minutes munitions are spent which would in the ordinary course of events have lasted for as many hours ; sometimes, on the contrary, the expenditure is small, but they are used simultaneously instead of successively ; the guns are longer silent ; they bide their time and only strike when the right moment comes. The result is more crushing and complete, not more costly ; though greater stocks are needed.

We have gone further still in diminishing the weight of the engine of destruction. An instrument has been made which is more easily worked than the machine-gun, midway between it and the rifle : the machine-rifle, an automatic weapon. It is the offensive form of the

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machine-gun. Weighing about fifteen pounds, only twice as much as the ordinary rifle, it is brought to the shoulder with the barrel resting on a fork ; it may even be strapped to the shoulder, and the infantry carry it across the open into the enemy's trenches ; this is evidently the rifle of the future. It will be capable of sweeping the ground with five hundred bullets a minute. As it will be no easy matter to carry the cartridges and feed the machine, it is unlikely that there will be more than one rifle for every two or three men.<sup>1</sup>

No doubt a fresh reduction in calibre will also be made. In reducing its bore from nine to seven millimetres, the Lebel rifle took a bold step forward in the reduction of weight, a profitable complement of rapid firing. Will not the abundance of light guns, such as the French '75,' their power and rapidity of action against infantry, and probably the invention of a large-calibre machine-gun, dispense with the use of the rifle for distances greater than a thousand or twelve hundred yards ? Then we might be restricted to a machine-rifle with a bore of 4 or 5 mm., perhaps

<sup>1</sup> We can easily imagine infantry in which, for every three men, one would have a rifle, the second, instruments of defence, shovel and pick, barbed wire, shield, etc., the third, hand-grenades.

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less, if we obtain a heavier metal for the bullet and greater initial velocity. We might project tiny arrows causing only slight wounds, hardly dangerous unless they touched a vital spot, but sufficient to put a man out of action.

The opposing fighting lines are drawing nearer and nearer to each other. We have two arms which carry us back almost to the wars of the Middle Ages: the hand-grenade and the mine.

Amid all this increase of mutually destructive machines, it is curious to note the return to a projectile hand-thrown like the stone, the first weapon of the human race. The grenade is a sphere charged with high explosive, the fuse of which is ignited by the drawing of a pin just before it is thrown by hand. It can be hurled a distance of fifteen or twenty yards, or it may be fixed to an arrow propelled by a special cartridge in an infantry rifle. In this case it covers a distance of four hundred yards. Grenades are factory-made, but at the front their equivalent has been made out of any handy material, and particularly out of *boîtes à singe*, or corned-beef tins, filled with explosive, the fuse being lit by hand. They are fastened to small wooden rackets.

Sap warfare is quite as archaic. In its primitive form it dates back to the most

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remote antiquity. Its newly acquired importance is due to the present strength of trench-defended fronts and to the power of our explosives.

When we cannot move forward above ground, an advance is made underground by mining beneath the enemy's line. This has always been done in siege warfare, when permanent fortifications presented an impregnable front. The reply consists in a counter-mine, directed toward the enemy's mine to render the latter ineffectual. Formerly the aim was to debouch in the mine itself ; now it is sufficient to come somewhere near it, preferably underneath : it is possible to act from a distance, explosive effects carrying some way through the earth. Their range, however, is limited to a few metres.

To find out where the sappers are digging, the adversary listens. Microphonic apparatus will assuredly enable us to hear better than we can at present and almost wholly to eliminate that element of surprise which is characteristic of sap warfare. Here, too, individual genius will give way to regulated effort and collective preparation. Success will depend on questions of mass and of engineering.

The first task of engineering will be mining.

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Working by hand, one progresses about two yards a day. There are boring machines which will excavate the earth three or four times as quickly if properly adapted to the ground. Their one drawback is the noise they make.

Considerable improvements will be effected in timbering the walls and clearing away the earth. As it is generally an important matter to anticipate the enemy in laying mines, speed is essential and of first importance.

When there is only a short distance further to go before laying the charge, borings are sometimes made very rapidly: the boring tools cut out a small opening a few centimetres in diameter, into which a dynamite petard is inserted. The explosion of the latter supplies a chamber. Such is the beginning of a speeding-up method in sapping. Subterranean warfare is only at its dawn.

Even now it entails an enormous expenditure. A mine chamber may have two objects: it is either offensive or defensive. In the former case, it must explode the earth right to the surface, destroying both troops and their shelters; in the latter, it will ruin an enemy's mine, either by causing a premature explosion or by obstructing the passage behind the mine chamber, or again by crumbling up the ground

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in front of the line of progress, so that no further advance is practicable.

The French call these defensive borings *camouflets*. They require only a moderate charge. The offensive chamber, however, sometimes requires one hundred and fifty kilogrammes of high explosives. A war like the one now being waged uses up monthly hundreds of tons of underground explosives. We must look forward to a mighty development in operations of this kind when we attempt to force trenches that are strongly constructed, defended by unconquerable artillery, and when we cannot obtain mastery of the air.

It may also happen that, if the supply of explosives gives out, the mine, rapidly enlarged and lengthened, will be a mere prelude to a direct attack with cold steel.

[The latter is still the *ultima ratio* of fighting. Artillery duels, mine explosions, the sweep of the machine-gun, the throwing of hand-grenades, are all when analysed only preparations.

They all lead to a hand-to-hand fight. Consequently the bayonet has always played a *rôle* of supreme importance, deciding the fate of many a desperate encounter. Even the bayonet is too long for the narrow field of carnage of the trenches. The rifle hinders the grenadiers when hurling their petards, crawling



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between the lines and cutting barbed wire. They prefer to arm themselves with a long dagger, a regular 'bowie-knife' fastened to the waist. But the best weapon for this kind of work is perhaps a short South African club, the knobkerrie, which has met with considerable success in the British Army. If the machine-rifle supplants our bayonet-holder, who knows but that a light spear, slung across the back, will effect a final separation between the two death-dealing weapons?

Our fighting men only need a shield to be like the warriors in the *Iliad*. Its introduction into our armament has actually been demanded by a number of soldiers whose cause was taken up by M. Maurice Barrès. At present the helmet either prevents or renders harmless many a head wound. A portable shield would be too heavy if it were expected to withstand machine-gun fire and to cover a man, even in a crawling attitude, but the rolling shield may some day become an actual fact. Armoured *épaulettes* are being tried: 'greaves' to protect the legs would be quite as useful, for machine-gun barrage fire sweeps the ground very low.

## CHAPTER XXV

### THE TRENCH: OFFENSIVE AND DEFENSIVE USES

**W**E will pass rapidly over the squirting of flaming liquid into the trenches by fire-engines; over asphyxiating gases and other accessory applications of science to the art of destruction. The former is less effective than aerial torpedoes; the latter presupposes a favourable wind. )

It is principally fumes of chlorine and of bromine, or of other gases of which nothing may yet be said, that are released in front of the opposing lines, so as to form a low cloud which rolls over the enemy. Protection is obtained by means of masks which filter the fumes through a spongy tissue, impregnated, for instance, with sodium hyposulphite. But asphyxiating gas is a weapon which cannot be used uninterruptedly, since it needs a wind blowing steadily from a fixed direction. Once its effects have been produced, in case a fresh attempt is contemplated, a relatively long time

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is needed for setting up the gas plant on the conquered ground.

Consequently complete success could be obtained only if the belt of resistance to be overcome were extremely thin and if there were neither support trenches nor strongly organized forces behind it. Besides, the gas advances in parallel lines ; it does not, at the sender's will, radiate its fatal effects all round the starting-point ; so that if it cuts up, on the opposing front, a sector in which the assailant is advancing, the latter will thereby find that he is exposed on both flanks to dangerous counter-attacks. To meet them he will not have the advantage of the deadly gases : the wind that carries them forward will not blow them to the sides. The offensive point, driven like a wedge into the enemy's ranks, runs a great risk of being overwhelmed by the increasing pressure of lateral counter-offensives. This, in reality, is what happened at Ypres. In spite of the surprise caused by this novel engine of war, the attack was finally paralyzed. Such attacks are effective only in carrying salients.

The other method, that of flaming liquid, which appears even more terrible since it admits of scarcely any protection, has hitherto given no great results because of its restricted range

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and for certain other reasons which so far have prevented its general application. Nevertheless, we find that our enemies are adopting it more and more in close combat. When the lines are less than thirty or forty yards apart, it is easy to sprinkle the enemy with fire. In assaulting, the infantry are preceded by a detachment of fire-bearers, each carrying his own tank of inflammable liquid. This he projects to a distance of about thirty yards: it is an improvement on the bayonet.

In the Champagne fighting, the Germans often used these flaming jets. In certain places the smoke was so dense that it gave the impression of the explosion of a very powerful mine, and petrol was occasionally seen flowing past like a stream. Their trench *Flammenwerfer* are metal cylinders, about three feet in height, fitted with a pipe eight or ten yards in length. We also have constructed models, carrying several hundreds of yards.

However frightful all this may seem, we must not forget that any invention which may be dangerous to those who use it has but a brief existence. Moreover, if there be any safeguard, the adversary will be certain to make use of it also. We must not trust inventions that are too obvious: the defensive develops simultaneously with the offensive,

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responding to the advances of this latter by like advances which are frequently but the consequence of the same operations. Thus a balance is effected, as by an inevitable law.

This balance, however, is not rigid ; it leans now to one side, now to the other, before reaching a more or less perfect level. At present the defensive would appear to have the upper hand. Look at the trenches : they form an insuperable obstacle along the whole front. Never have armies as a whole been so paralysed by entrenchments as those that have been facing each other for more than three years on the Western front. The cry will soon be raised that defence has finally proved superior to attack !/ Some will even add that war will, in consequence, speedily become an impossibility. Finally, others will wonder why no one thought long ago of the marvellous efficacy of trenches, which could have been dug in past times as well as now.

If trenches make possible a successful stand against present-day weapons, how much more easily could they have stood against the rifles and ineffectual guns of former times ? Would they not have rendered invincible any army that had been so well-inspired as to think of sheltering behind them, forty or fifty years ago ?

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Every one knows how trenches are made. It was indeed an easy matter to construct them. Was it simply because no one thought of it that nothing more than fighting in the open was meditated in France, not only in 1870, but even previous to 1914? This is a question to be answered, not by us, but by higher authorities. Perhaps the inadequate supply of men made the trench ineffective in the past, by preventing the entire line of the frontiers from being barred. The fortified front would have been in danger of being out-flanked. At any rate, we are mistaken in attributing what we now find to a preponderance of inert defence.

Rather does it correspond to the failure of the defensive. The fortified towns, in which had been collected the most formidable defences, hardly held out more than a few days when they trusted to their concrete ramparts and turrets of steel. The modern high explosive shell crashes through and breaks up everything. No permanent structure can withstand its effects.

Nevertheless, the enemy's assault broke down against Nancy and Verdun. He never succeeded in crossing our hastily-prepared lines between Belfort and Nieuport. Entrenchments resist almost as well when they consist of

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a deep furrow protected by sand-bags as when represented by the proudest bastions. Is this because their virtue lies not so much in the protection they afford as in the might of the arms supporting them?

It lies in the two combined. (Why cannot the distance between the lines be crossed? It could be in former times. The new factor consists of the impossibility of moving over open ground within rifle-shot. The quick-firing rifle and the machine-gun have made the trenches impregnable. This results from the new destructiveness joined to the time-old harmlessness of the bullet, for rifle and machine-gun fire allows no one to stir outside the trench, but it does not—and never will—hit any one within it.

Trench warfare, then, is bullet warfare. Even now we can see what is destined to end it: shell warfare. Whether from gun or aeroplane, the shell kills those in the trench as well as those outside, though not so easily. Its effects are limited by splinter-parrying traverses. No doubt some day there will be dropped from above showers of bombs, that will prove more effective against men, who have burrowed into a number of separate holes. A shower of small arrows along the whole front would be still more deadly.

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Even now artillery sometimes makes ordinary trenches untenable ; it prevents the mustering in the rear of storming parties. If the guns were protected from shells by their breastworks, and by invisibility, as the foot-soldier is protected from bullets by his *talus*, or slope, the situation would have no other issue than that of mine warfare, a protracted operation.

But artillery destroys artillery from a distance, hence a duel between big guns, which must precede any attack on trenches. These can easily be taken when one artillery has emphatically triumphed over the other ; but the advantage of the trench is that it compels delay in deciding the issue.

The duration of this preliminary phase varies. Small calibres, which exchange a good number of shots at close quarters, quickly silence one another : once located, a battery is either destroyed or forced to move away. Big guns, on the other hand, with a long range, have few chances of hitting one another ; a gun is too small a target at a distance of twelve miles. Hence their appearance in warfare threatens to immobilize the fronts. There will have to be a considerable addition to the small quick-firing guns, so that they may do their work by venturing within the big guns'



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fire, and charge up to the spot at which these latter will come within range. The defeat of the heavy artillery, however, will be mainly the task of the aerial squadrons.

[ We now know that the strength of the defensive is mainly due to the use of offensive arms. What makes a line of trenches impregnable is the number both of the machine-guns concealed therein to prevent any approach, and of those which, farther in the rear, prevent the enemy from going beyond ; it is the storm of shells which breaks the enemy's attack before he is within range, and the howitzers and heavy guns which keep in check the enemy's light artillery.

Nevertheless, the part played by fortification is not negligible, and its technique is being perfected. The trenches themselves, which protect against bullets, are carefully timbered, sometimes protected with iron girders, supplied with traverses to prevent enfilading, supported by small forts. They are comfortably fitted up and drained. They are screened from observation by roofs made of planks and branches ; concealment is perfect. Lastly, the wall is covered with concrete, the better to withstand the assaults of the average gun.

Then, too, there are subterranean shelters, sometimes fitted up in cellars or quarries, more

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frequently of the dug-out type. Even the ceiling is covered with concrete. A new warfare, that of the catacombs, is beginning.] Along the passages are fitted up bedrooms for the staff officers, rest rooms, front-line ambulances, *dépôts* of munitions and supplies, reserve equipment, etc.]

## CHAPTER XXVI

### EVOLUTION OF NEW METHODS

**O**NE of the striking features of the present war is its plasticity, or rather its evolutionary character ; it is continually being transformed, assuming a new character. The war now being waged is not the same as that waged at the beginning by the martyr heroes of Belgium, the ill-fated heroes of Charleroi, and the victorious heroes of the Marne : in its resources, methods, and tactics it differs from these as greatly as the wars of the eighteenth century differed from those of the seventeenth. Within a few months we pass through stages which would once have taken generations.

[Why does this evolution proceed so rapidly ? Perhaps because industrial equipment is now so effective that great progress can be made in a short time, and the development of intellectual culture multiplies its seed in all directions. The enormous masses engaged, of men, supplies, arms, financial resources, etc., make it possible for war to last long

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enough for all this progress to arise and be applied, and thus the aspect of the strife is periodically changed.

We must not imagine that this is unprecedented. In all ages, as wars have run their course, new methods have revealed themselves, though rather during the period from one renewal of conflict to another, during a series of conflicts, than from one combat to another in the course of the same operation. We have not forgotten how the consul Duilius planned a transformation of the Roman navy, when, by adapting to his ships the boarding-plank called a 'crow,' he turned naval fights into infantry engagements, and snatched from the Carthaginians the mastery of the sea. This decided one phase of the struggle between Rome and Carthage, but it was a result which had been prepared for in the interval between two campaigns. The creative genius of Napoleon, by organizing the *Grande Armée*, and the Boulogne flotilla, and subsequently the vast armies that marched side by side in the expedition against Russia, gave considerable impetus to the military science of his day. Nevertheless, with two adversaries pursuing the same continuous campaign against each other, it has never before occurred, as at the present time, that one of them would have

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been powerless, helpless, if he had not transformed the military tactics employed at the beginning of the struggle.

The battle of Verdun brings out this evolution of tactics, in the course of which three or four experiments stand out with some prominence. Starting from the Charleroi period we note the appearance of asphyxiating gases on the 22nd April, 1915. Continuing with the May attempts in Artois, and the September operations in Champagne, we reach a natural culmination in the form of combat which developed at Verdun.

[ In August 1914 the war was one of movement, in accordance with academic precedent : cavalry screens, automobile raids, infantry charges were employed according to the textbooks. In the interval between two marches the troops sheltered for a brief space, behind hedges, in ditches, or lying flat on the ground. What was new, though not wholly unexpected, was the shattering effect of heavy artillery against forts. Very soon the efficacy of machine-guns and of rapid rifle fire compelled the men to dig themselves in : this constituted the first great change. It dates from the halt of the Germans on the Aisne, when retreating after the battle of the Marne.

Since then we have witnessed various

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attempts to break through the lines. Underground work has proved inadequate, though the problem is the same as in a siege : a breach must be made. The difficulty, however, is caused by the fact that new entrenchments are constantly organized behind those destroyed or threatened.

On the one hand, the machine-gun has rendered adequate a simple trench, quickly dug and even more quickly protected by barbed-wire entanglements ; walls like those of a fort are not necessary for stopping an enemy's army. On the other hand, the wide expanse of open ground behind a line of circumvallation, hundreds of miles in length, leaves all the room that is required for successive lines, replacing one another as often as is desired. Consequently, the defender is not hampered, as in an invested fortress, by the impossibility of drawing back his defences. The latter, mobile and easily improvised, free on a wide-stretching battle-ground, break away and escape from the enemy's grasp.

For crossing trenches, something less protracted than sapping had to be found, something which would instantly enable men to leap over juxtaposed lines and pass on to the free space behind, in a dash. Then, a recommencement might be made of that war

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of movement which still seemed to be the real warfare, and from which the two sides were separated only by the narrow line of trenches. The Germans imagined they had discovered the means of victory in asphyxiating gases. These actually did prove a success the first day they were used. We know now why this success was to have no morrow.

While relying on gas to obtain a surprise result at Ypres, they did not fail to develop at the same time the usual methods of fighting. We, too, did the same. This resulted in the simultaneous preparation of two engagements destined to meet with very different success : that of Görlitz and that of Notre-Dame-de-Lorette.

At Görlitz, the German attack, which began on the 1st of May, was launched against too confident an adversary whose line, somewhat weak and venturesome, had probably in the Carpathians carried the Austrians before it rather too rapidly, and was unprepared to withstand the shock of the Kaiser's armies. Treachery in their own country had previously lessened the munition supplies of the Russians ; in particular, their principal munition works had been blown up. Consequently the attack upon them succeeded, and their destitute condition forced them to retreat until they

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were in a position to obtain fresh supplies. However, this war of movement did not progress at a rate of more than three miles a day. This was far from the dashing advances that followed Napoleon's battles.

In Artois the French were less fortunate. They did not break through, but advanced only to a very limited extent.

In both instances the same method was employed : a breach was made in the trenches by the artillery, mainly by heavy guns : fifteen hundred cannon are said to have been mustered in front of the narrow sector of attack at Görlitz. The artillery preparation was formidable. It was even more so round Notre-Dame-de-Lorette, besides being more scientific, detailed, and protracted. It succeeded in overcoming the resistance of the enemy along most of the attacked front. Destroyed, disarmed, or demoralized, surprised by the sudden dash of the first assault, they gave up wide stretches of ground almost without a struggle. But the organization of support positions and reserves would have brought the French to a halt, even if a number of subterranean refuges had not concealed machine-guns ready to hold salients in their onrush and paralyse their advance by flank firing.

Our preparation succeeded in destroying



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neither the whole of the machine-gun hiding-places nor the whole of the wire entanglements. It was powerless to silence the enemy's counter-batteries.

On a less difficult ground, the experiment, even better organized, was repeated in Champagne on the 22nd September, 1915. The front of attack was wider and the preparation more intense. The assault, preceded by a seventy-two hours' bombardment, developed on bare ground; the defence had been pulverized. Thus, in a single morning, almost without a blow, the French acquired a strip of ground three miles in depth by eighteen in breadth.

Nevertheless, while the extension of the bombardment in breadth had rendered any flank attacks ineffectual, so that they were able to advance in the centre along a road no longer threatened, they had not produced the same destructive effect in the rear zone, which held forces of artillery and infantry almost intact: three or four times the depth of front would have had to be bombarded, and this, as the objectives were farther away, might have required ten times the number of long-range shells and guns. Our reserves, compelled to approach the battle-field under the fire of the enemy's guns, were obliged to take

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precautions, and were to become crammed on top of one another in the approach trenches ; they were unable to dash forward, where they were most needed, in such a way as would irresistibly have driven our first columns through the enemy's supports.

The battle of Champagne proved that an entire front can be smashed, but not to a sufficient depth. From a great distance, it is only by chance that one can hit a gun the position of which is known exactly. But, again, this knowledge has to be acquired. When use was regularly made of aviators, and the command, in this way, found means of exploring the enemy's lines, both sides had to think of concealing their numbers and strength. Trenches and guns were covered with foliage and branches ; the transport, the very gun-carriages, were decked with strange paintings which caused moving batteries to look like bits of stage scenery. When at rest, the engine of death may be mistaken for the markings of the soil or the pattern of the grass, for trunks of trees or dead leaves : this is known as *camouflage* or ' make-up.'

## CHAPTER XXVII

### THE NEW TYPE OF BATTLE

**W**HEN preparing their offensive against Verdun, the German High Command endeavoured to provide against the two main drawbacks felt in September, with regard on the one hand to heavy artillery, and on the other to the supply of reserves. They brought together huge masses of heavy guns, 21 cm., 28 cm., 30 cm., and 38 cm., in such quantities as had never been heard of before, and expended ammunition with the utmost prodigality.

When Forges was attacked on the 6th of March, it was stated that the battle of Verdun would go down as the greatest artillery duel in the war : five hundred batteries were heard simultaneously, a million shells are said to have been fired in twelve hours ; many sectors of the French front each received an average of one hundred thousand shots. A private letter stated that a rectangular space, four hundred and fifty yards long by two hundred yards wide, had more than eighty thousand large calibre

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projectiles showered upon it; one for every square yard. Between the 20th February and the 7th March it is estimated that ten million shells were fired on both sides. The 305 mm. and the 150 mm. batteries set up in the Spincourt Wood belched forth such a deluge of fire that our aeroplanes were unable to photograph them, the plate showing nothing but one uniform sheet of flame.

Artillery preparation was therefore more intense, or at least more widely distributed, than in Champagne. It was repeated several times, the number of large calibre guns making it possible to cover a deeper field. Even the army quarters on both sides were subjected to fire.

On the other hand, a railway transport system had been organized by the Germans in their rear. The principal reason which compelled them to attack on the northern sector was that they were obliged to bring by rail the large calibre guns, in particular, most of the 420 mm. howitzers, of which there were a dozen, and their huge reserves of munitions. As the line from Conflans to Etain was under the French fire, they connected with the Conflans-Longwy line a new ordinary-gauge branch line, running from Spincourt to Montfaucon.

In the various actions of this struggle, which lasted several months, they succeeded in bringing

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on the battle-field dense masses of troops ; the waves followed one another without a break up the slopes, where they were successively decimated by our defences.

Yet, as we know, these assaults were even less effective than in Champagne. Not that the trench offered adequate resistance : the ground is stated to have been completely ravaged, there is nothing to be seen but the craters produced by the shells themselves. But this destruction could never completely cover more than the foreground of the surface attacked. Behind, the means of defence remained at least adequate if not altogether intact.

It is impossible to accumulate during many months, in front of the place chosen for such a battle, the necessary material and troops, without arousing the attention of the defender and inviting him to muster his forces in reply. We have then to deal with a formation of considerable depth, and more than an impression on its fringe must be made. Even on this very fringe, in spite of the ravages of the artillery, elements of resistance remain.

Fortifications in the open provide deep shelters for men and portable material : *i.e.* considerable cover ; barbed-wire entanglements and *chevaux-de-frise* : obstacles to any advance ; and finally various forms of concealment,

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breastworks, and sometimes caves, for the artillery. The heaviest projectiles do not invariably break through subterranean shelters covered with eight or ten metres of earth, and when they do, the whole of the men sheltered there are not always destroyed. The most intense bombardment often leaves untouched whole portions of a fairly complex wire-entanglement, which sometimes spreads over hundreds and even thousands of yards in depth.

Gunners and artillery pass miraculously through tempests of fire. In an epic account, we read of them, for instance, at the most terrifying moments at the beginning of the battle, near the Caures Wood, defending to the last one of these fields which was suddenly surrounded by vast numbers of the enemy. The episode deserves to be handed down the ages. Our men, after an awful tempest of iron and death, cut off from all communication with the rear, withdrawing in the most difficult circumstances, almost surrounded, without food, above all, suffering intensely from thirst, as they had not drunk a drop of water for three days, heroically reserved the last few drops of what should have been their drink to cool the guns heated by rapid firing. They continued to decimate their assailants and succeeded in saving part of their material.

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Then we are shown machine-guns emerging from their hiding-places, contrary to all expectation, to oppose the furious onslaught of the attacking side. In vain do the latter multiply their assaults, pile up and renew their serried columns, fling an entire brigade, as certain witnesses affirm, against two hundred and seventy-five yards of half-ruined trench : between grape-shot and barrage fire the attacking mass of humanity is crushed and swept away.

Indeed, barrage is one of the principal methods employed in the present war, and it is something new. The enormous numbers of projectiles which characterize it are a necessity. Barrage is a wall of projectiles flung upon a line so as to cover it with an obstacle which no human being can pass through.

There is the barrage kept up by machine-guns, chiefly at night-time, when it is possible neither to take aim nor even to detect an attack so as to sweep it away by guesswork ; we have to be content with preventing the enemy from crossing some fixed point, a particular route or glaxis, by pouring on it an uninterrupted shower of bullets.

Barrage is also used against attacked positions ; it is directed on the rear of the enemy's first lines, so as to prevent reinforcements from coming to their support. The enemy replies

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with a counter-barrage, hemming in the assailing troops in the rear and leaving them isolated, without any possible assistance against counter-attacks.

The efficacy of barrage fire is such that we find the attacking troops, after their initial success, so completely cut off from their supports that they are unable to communicate with and inform the latter of their position, as was the case in Artois.

This barrage produces the curious result that the battle is made to depend on fighting within a restricted area, confined on both sides to a certain number of champions whose destruction is witnessed without the possibility of affording them help. We find the two armies repeating the combat between the Horatii and the Curiatii.

The main characteristics of barrage are its density and continuity, its duration and precision. It necessitates an abundant supply of munitions, minute and accurate preparation obtained by aerial observation. We must become acquainted, foot by foot, with the distant ground over which the enemy has to pass to run to the rescue; we must know better still the ground on which the assailants are settling in order to hold the positions won.

Strict accuracy is necessary, even to a yard



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and a second ; if the firing is short, one's own troops are bombarded ; if too long, the numbers of the enemy are increased. The supporting troops, which it is intended to send into the restricted area before the barrage begins, must take advantage of the few moments in which the enemy's artillery, still ignorant of the exact spot reached by the withdrawal of his own troops, leaves the latter a little breathing-space, a slight margin for avoiding mistakes.

We see how very carefully all preparations, information, and orders should be regulated : a veritable triumph of precision.

The situation created for the offensive is a difficult one. After one side has with its fire razed all the material defences of the ground it is invading, it finds itself exposed to the enemy's counter-attacks, without being able to call upon its reinforcements. Time must be found to organize this unoccupied ground, and to do this a continuous barrage must be maintained. Hence an enormous expenditure of projectiles.

In the future, we may conceive of the advance of troops and their installation as being preceded by a permanent barrage. Between the zone battered by heavy artillery, bent on destroying a similar heavy artillery, and the zone of cold steel fighting we shall have that of

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barrage or of successive barrages by guns of different calibres, and that of material destruction by trench howitzers or by mines.

In this way all obstacles—guns, men, entrenchments—will be crushed simultaneously by a huge destructive combination, preceding the attacking army.

Even now, the barrages and this continuous hail of projectiles are so terrible that mass attacks lead only to useless hecatombs wherever the defender has succeeded in retaining some of his power to retaliate. The Germans themselves, who still practise mass assaults, because they lack troops with enough nerve to be led to battle in dispersed order, now have recourse to them in fewer and fewer cases.

They owe most of their successes to another method, that of small groups. After the devastation of the lines to be won, effected by big gun firing, a reconnoitring party, fifty men strong, cautiously advances. They make sure that the occupants have cleared off, that there remain no more machine-guns. Only then do parties of pioneers and of men armed with hand-grenades hasten up, for the purpose of taking possession of the ground, and rapidly organizing it; these are followed by the occupying infantry, advancing in fractions and gradually spreading out, or by a final attacking wave.

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Care is taken not to arouse attention, not to draw the fire of the guns.

What, then, was the cause of the continual German defeats before Verdun, in spite of the advance in armaments and methods, and when the French had almost succeeded in Champagne? It was due to inferior executive skill, to less finish in tactics as well as in firing, and even in projectiles. In almost every detail the French are superior in quality. It was also due to a parallel development of the armoury of death on both sides of the battle-field.

In order to win, there must be either a complete surprise, or the means of obtaining an early and complete victory in one at least of the technical domains which remain comparatively independent: a crushing superiority in big guns, for instance, as at Görlitz or in Serbia, or the elements of an aerial bombardment capable of paralysing the supports behind the lines.

Even then we may wonder how far a success of this kind would tell, and what form of mobile war it would permit. We may take as an example the Russian retreat after the forcing of the lines of the Dunajec. The scarcity of munitions, which had paralysed the defence of these lines, also forbade any counter-attack. And yet the Germans never succeeded in realizing their intention to effect a large breach in the

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front, to tear asunder the protecting curtain behind which the indispensable transport was carried on—in a word, to take the opposing lines in the rear and intercept their communications with the centres that supplied them. The only instrument of destruction capable of breaking through lines constantly reconstituted was the heavy artillery, which could, however, advance only at its own slow rate; not thus was it possible to disorganize an army retiring in good order and to reap the full victory.

When both sides are equally, or almost equally, armed, the result must be still less decisive. We have no longer to deal with a slender line, but with a network of trenches and batteries, extending several miles in depth and reconstructed in the rear as fast as its outer surface is broken. The attack sinks into it as into a pillow; to cut clean through would necessitate a sudden irruption incompatible with the efforts to be expended.

At most, a 'bulge' is effected. This is what happened to the Germans at Saint-Mihiel. A salient is formed, which is difficult to hold, and, speaking generally, more dangerous than profitable for the side that has driven forward. It is exposed to flank pressure, to a stranglehold which may cost it dear; so that it may be advantageous in certain cases to allow an

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incautious enemy to engage within our lines as between the jaws of a vice.

Thus is the struggle immobilized, since a local success, however pronounced, produces on the fronts no more than a local change. Adequate means to force back one side along its entire front are beyond the capacities of output in munitions of the belligerents. They fight where they stand, until the weaker is exhausted. The struggle will be decided, not by gains, for nothing substantial is gained, but by losses. The side compelled to attack is defeated in advance, for its losses, alike in money, material, and men, are greater than those of the defender.

Hence the importance of the blockade. Its influence increases in proportion as the war, in its transformation, costs more for less ground captured.

Not only must one remain in control of sea commerce, but it has now become a vital necessity to develop, close to the armies and on the very territory of the principal belligerents, the greatest possible industrial power. We have a striking illustration of this in the fate of Russia after Görlitz. It is impossible to trust to contracts with neutral industries more or less distant which cannot be speeded up as occasion demands. By reason of its very duration, the war becomes of necessity the concern of the

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entire nation ; it absorbs and sets to work the whole country.

The effort it demands is not only the sum total of what can be given by a nation roused to ephemeral enthusiasm ; time also has to be taken into account, since the aspect of things changes ; each period, nay, each month brings unexpected problems and introduces threatening factors.

All these novelties, born of war, have not time to mature and become incorporated before it comes to an end ; nevertheless, some of them are daily introduced into military art and into the bloody drama now in progress ; the longer it continues, the greater the transformation. The new technical elements are not the only cause of the changing aspects of the war ; we must also take into account the progress made in their application. Profound modifications may yet surprise us, either as the result of some technical process or because known methods acquire an importance they have not hitherto possessed. We were not unacquainted with heavy guns in 1914 : it is their numbers and proportion to the whole that have changed. This alone has revolutionized tactics.

We must therefore be prepared, to the very end, to prosecute research and experiment, to intensify manufacture, and to carry each ele-

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ment of success toward perfection. At the present stage it is not enough to be the equal of an enemy who incessantly strives to surpass himself. Before the force to be resisted comes into being, we must be preparing to resist it, we must calculate the strength of our blows according to what will be the strength of the adversary. Thus it is necessary to look far ahead, and to act on a big scale. A narrow outlook, sluggishness, or misplaced economy would be fatal.

Since the art of war is in constant evolution, since it lives and is plastic within our hands, it ought to absorb our utmost efforts ; we should wage it not only with all we have but with all we are, with every resource of mind and will, and with all the powers of living forces, power of adaptation to conquer all obstacles, resilient power to turn resistance into attack, passion with its myriad aspects, and bull-dog tenacity of grip. Right up to the very last moment, we shall never have the right to lull ourselves to repose in the fancied security that our methods cannot be improved.

## CHAPTER XXVIII

### UNDERGROUND WARFARE

**A**S we have just said, new technical elements are not necessary for transforming the art of war : only change of proportion is needed. We have been given the most striking instance of this in the new applications of trench warfare. The latter has become a regular system ; on it, as on some unfolding organism, auxiliary organisms appear or multiply. It is the fermentation of life itself.

Before generalizing the consequences of the trench, strictly so called, let us mention some of its auxiliaries. In the first place, we have barbed wire, which has become inseparable from it. In front of every trench is stretched an entanglement. To pass it, either a veritable tempest of shells must have wrought almost utter destruction, or else the assailants, beneath a hail of bullets, must have cut through the wire with pincers. We are beginning to insert between the wires wooden beams or T-plates. Against hand-grenades, protection is also being sought by close wire-netting.



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Behind all these shelters a man is in a comparatively safe position, but he cannot, without exposing himself, appear at a loophole for the purpose of firing. Consequently, the trench periscope has been invented, an optical instrument consisting of a tube which is made to project above the parapet, and a system of mirrors or prisms reflecting the image downward. All that is now needed is to fit a periscopic aiming appliance to the rifle itself, and the combatant may remain quite hidden from view.

The communication trench is intended for approach, not for fighting. It brings the parallels into touch and forms an artery of circulation. It is the only means of passage; in many places one has literally to crawl like a snail. Miles and miles of approach trenches intersect the dual zone wherever the fronts are in proximity to each other.

This warfare under shelter utilizes human habitations as a matter of course. In the eighteenth century, armies carefully avoided any inhabited spot, which would have broken their strict order and weakened discipline. Nowadays we make the most of villages. A house speedily becomes a miniature fort. The cellars, in particular, being proof against guns of medium size, are used as a basis of operations

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for a sturdy resistance ; they are interconnected from house to house, and sometimes dug even deeper. The air-holes are protected by sand-bags ; there is just room for the mouth of a machine-gun to pass through.

The trench has its nervous system : the telephone. Sometimes, isolated for days at a time, it receives orders by telephone and makes known its position. The trench is informed of any attack that may be imminent. The telephone also indicates objectives for artillery fire.

A trench-digging machine, or rather a mechanical plough intended for canalization purposes, had been invented in Belgium ; the Germans have made use of it in the present war. In one minute the machine excavates a cubic metre of earth. In favourable ground it turns up over a hundred yards in an hour ; a gang of two hundred men would be required to obtain the same result with spade and pick. As an instrument of war, however, it offers serious drawbacks. It is extremely vulnerable, and, being very slow in its movements, cannot keep pace with an army on the march. The result is that it is used only behind the fighting lines in preparing trenches beforehand. While, however, these conditions were exceptional in the past, they are now becoming

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general, so that the digging machine will be largely used.

The Franco-Belgian front alone extends about six hundred miles. In certain places on the German side thirty-two lines of parallel trenches have been counted. If we add to these the approach trenches, we cannot estimate the total to be less than twenty-five thousand miles.

Will trenches be less used in future wars? In the expansion of the spheres of operation, the abundance of means of transport, and the great numbers of effectives, we find reasons for doubting this. So long as the trench possesses its defensive value, we must be in a position to use it from the very beginning of hostilities, in order to support the covering troops and to give security to the forces charged with the duty of occupying defensive sectors. In the organization phase upon which we have entered, everything must be prepared beforehand. The aggressor is determined to put forth his maximum effort from the very beginning of the war; his opponent must therefore be ready to receive him without having anything to improvise. Whatever can be done in advance must be provided in good time.

We are thus led to suppose that, even during

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peace, lines of trenches will be set up along the frontiers, with every possible improvement. How useful such a trench system would have been to us immediately after Charleroi, for the purpose of momentarily barring the invader's path and enabling us to reorganize our forces on the Somme, and not on the Marne!

We will try to picture the perfected form of such an organization. A kind of rampart surrounding a whole country is strengthened with thick walls of reinforced concrete, with heavy steel casts, with pilasters and embankments. The wire network permanently stretched over the glacis is a real maze of barbed wire. It stretches over a mined country, and in accordance with a well-planned line, with forts at its angles and enfilading positions. Some of the heavy artillery is in position and platforms are in readiness for the remainder. Groups of machine-guns are scattered under casemated shelters, or, linked with the light artillery, are held in readiness to cover, at a moment's notice, the few kilometres that separate them from their posts. The latter have been fixed in advance, as also the disposition of the troops in the two or three alternatives corresponding to the most probable plans of mobilization.

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To hold lines so formidably organized, a strong covering army would no doubt suffice, but it should be numerous enough to bring into play the principal means of action, for the defensive power of the trench is an active, not a passive one. Troops for the field will be obtained by mobilization. The frontiers are extensive enough to require almost the whole of the active army. In case of political tension on a single front, the garrisons of the frontiers that are not threatened will serve as nuclei for the reserves.

Consequently, in times of peace, all the troops will remain in garrison on the lines of trenches, detachments relieving one another for effective guard, for the inspection and upkeep of various works, the remainder being concentrated near by. This constitutes fortress service as applied to the whole of the national territory. In the rear and farther inland there remain only the command and the recruiting organizations: *dépôts*, stores, staff centres, groups of military police, etc.; but no real garrisons.

Our trenches are henceforth fitted up for permanent residence; what were at the outset but modest shelters have become casemated barracks, sunk deep into the ground, proof against shell and bullet alike. In them is

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found every comfort which such conditions will allow. They communicate by means of the network of approach trenches, which are now tunnels, open only where they lead into the trenches, and at the ventilation shafts. Consequently the enemy in the air finds nothing to attack. Probably, too, the trenches are mostly covered with concrete ceilings, leaving only loop-holes to fire through and outlets at intervals for deploying troops in the open.

The ramifications of these approach trenches resemble the branches of a tree. In each sector, those that are farthest from the front meet in one common trunk, which brings them all into communication with the railway. They mark the end of the strategic lines intended for the supply of the entire system. To prevent the enemy from discovering the movements of troops along the frontier, concentrations for attack, the passage of reinforcements, etc., it is most important that the railways in the neighbourhood should be safe from attack, that they should even be out of sight. Consequently the termini, at all events, of the railways as well as the lines parallel to the trenches are also tunnelled and linked up with the real approach trenches.

Into these thousands of passages the air

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is driven by means of ventilators, thought is carried along telephone wires, light and power are distributed by ramifications of electricity which supply the lamps, the searchlights, the drainage pumps, the various workshop appliances, the perforating machinery, the engines that convey supplies on prepared tracks, the subterranean cooking ranges, etc. As far as the sappers prepare galleries for attack, so far will they spread this network of power and of illuminant.

They also lay water-pipes and smoke-ducts. In Flanders, voluntary inundations have played a part that can never be forgotten ; they made it impossible to cross the line of the Yser. The resources of industry in the future will assuredly, on a large scale and over the entire surface of frontier districts, make it possible to organize, if not permanent flooding—a difficult matter on uneven ground—at any rate streams of water of enormous force. In the mountains great reservoirs will be kept up, always full of water ; these will communicate with the defence zone by means of huge pipes. In case of need, rivers will also pour forth their waters, hundreds of leagues away from their wonted channels. Lastly, from the trenches force-pumps may cause artificial streams to gush forth, intended to ruin the enemy's

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trenches. Who knows but that water will eventually become the worst enemy of the trench system ?

We have considered the use of smoke for purposes of offence ; it is also possible to employ smoke in defence, to hide from the enemy, to prevent him from noting batteries and the effect of his fire. In this case there is no necessity to use asphyxiating but only opaque or semi-opaque fumes. Attempts will be made to deliver these smoke-clouds either sufficiently far ahead to cover what it is desired to conceal, though near enough to enable our own observers to see, or in the air like a curtain extended overhead between the earth and the aeroplanes. .

The Germans convey to the first line trenches heavy cisterns which they open, veritable laboratories of homicidal chemistry. A distant factory could more easily supply the desired products by means of underground pipes.

In mine warfare, which is manifestly at an advanced stage in this catacomb system, deleterious gases will constitute one of the most dangerous arms. Within a few hours, a perforating metallic tube will have bored its way through. It may come from a distance and pierce an enemy sap, making a hole no larger than one's finger, driving forward a



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deadly current which will spread from trench to trench.

Then we shall think with regret of our glorious fights in the light of day. Death will be one black suffocation: the death of the miner from fire-damp. From high above the clouds down to the bowels of the earth one vision of horror and dread succeeds another. Human warfare will toilsomely follow its course in slime and mud on a level with the soil, midway between the fighting bees represented by the aeroplanes and the bellicose ants represented by the sappers. Beneath a lowering and stench-laden sky, crossed in all directions by flights of destructive aeroplanes, amid the crash and din of machine-guns, on ground convulsed with internal explosions, the soldier-mechanic will cling desperately to this poor oscillating earth. He will push along his guns on mud-sledges. His very life will be spent in suffocating murk.

It may be that the decisive effort will be made in the endless tunnels down which millions of men, heaped together in the dark, will descend to strike a deadly blow at the enemy's military industry. Munition and war material works, central factories of chemical products,

## UNDERGROUND WARFARE

will lie hidden beneath the sides of some mountain. Here will be fought the final battles, the combatants being caught between the water dashing along the ground and the fire kindled by the mines beneath their feet. With lights extinguished, along narrow passages all clammy with gore, they will slaughter each other in the dark. They will fight their way through corpses in order to get to the avenues of the subterranean fortress, where a final stand with explosives and poison will be made.

What a picture of horror! . . . If human genius continues to be applied to the art of destruction, war will become frightful beyond the dreams of imagination. When a corner of the veil is lifted, the future shows sights to make one shudder. And yet, who would dare affirm that an era of peace is really at hand? . . .

As we look back upon the past, we find that it has belied all the hopes of those simple souls who imagined we were about to enter upon an era of righteousness from which violence would be absent. Man is still a wolf to man. Is a change in his nature at hand? . . . As the centuries roll along, we see that the ways and means of death accumulate faster than the anticipations of experts. In every

